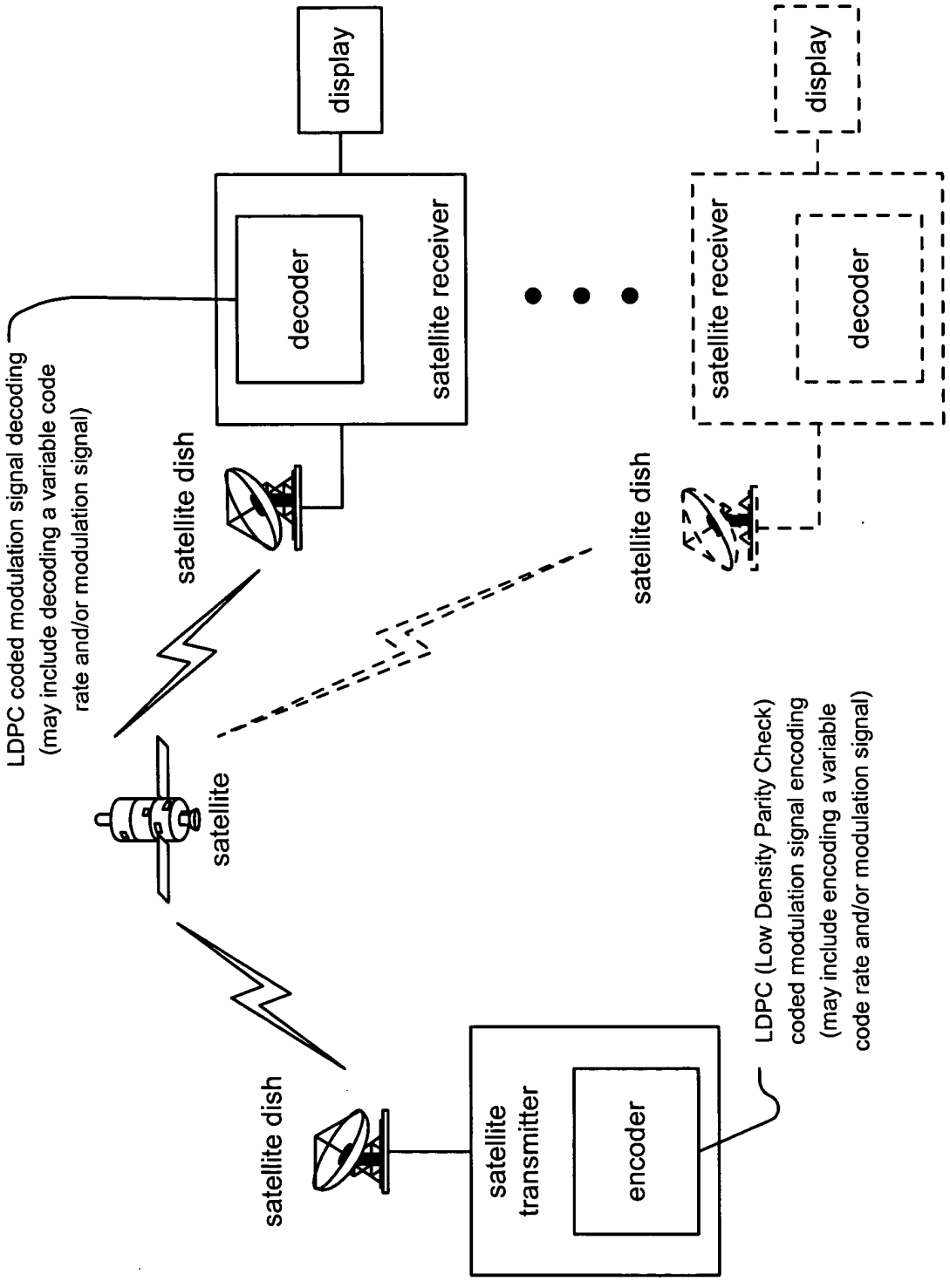
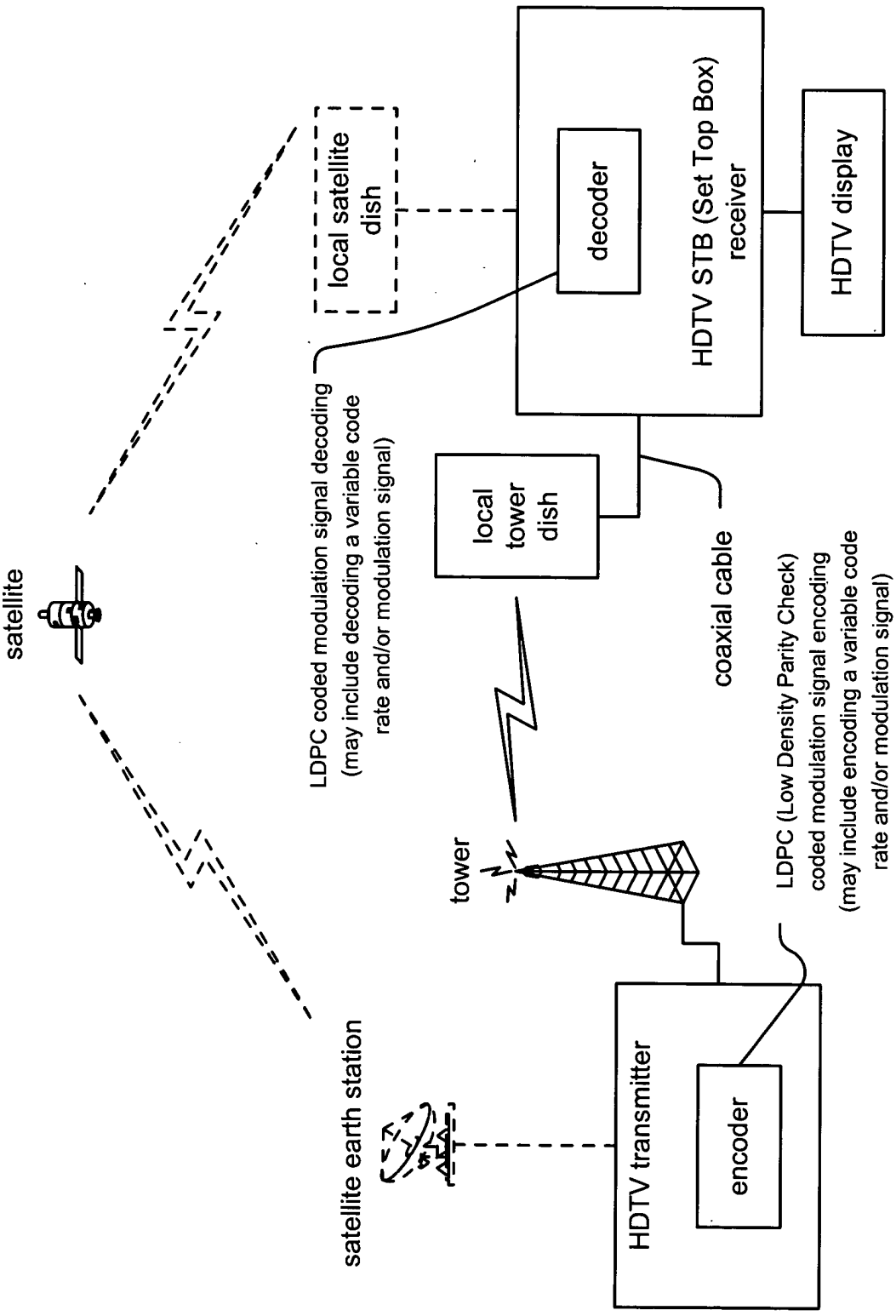


satellite communication system

Fig. 1



HDTV (High Definition Television) communication system

Fig. 2

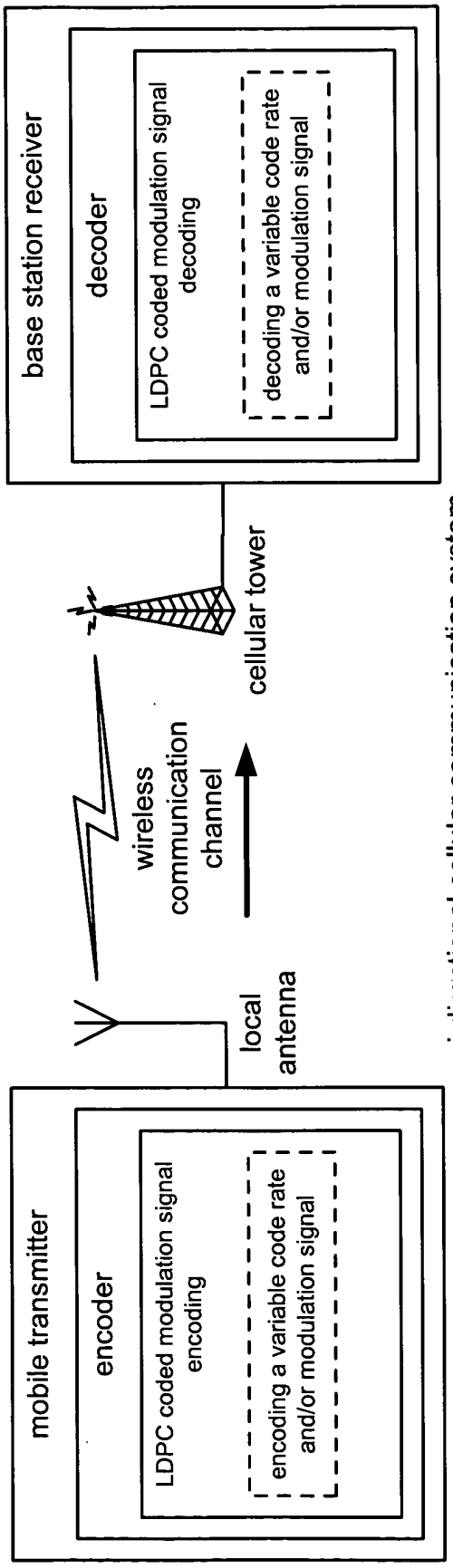

mobile transmitter
encoder
LDPC coded modulation signal encoding
encoding a variable code rate and/or modulation signal
local antenna
wireless communication channel
cellular tower
base station receiver
decoder
LDPC coded modulation signal decoding
decoding a variable code rate and/or modulation signal
uni-directional cellular communication system

Fig. 3A

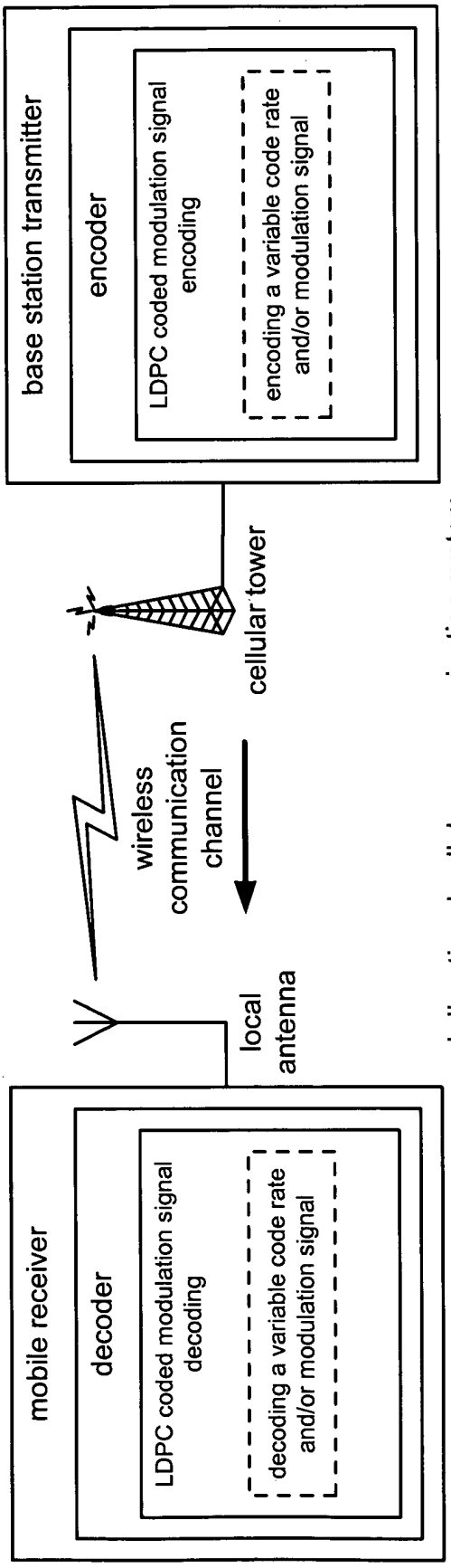
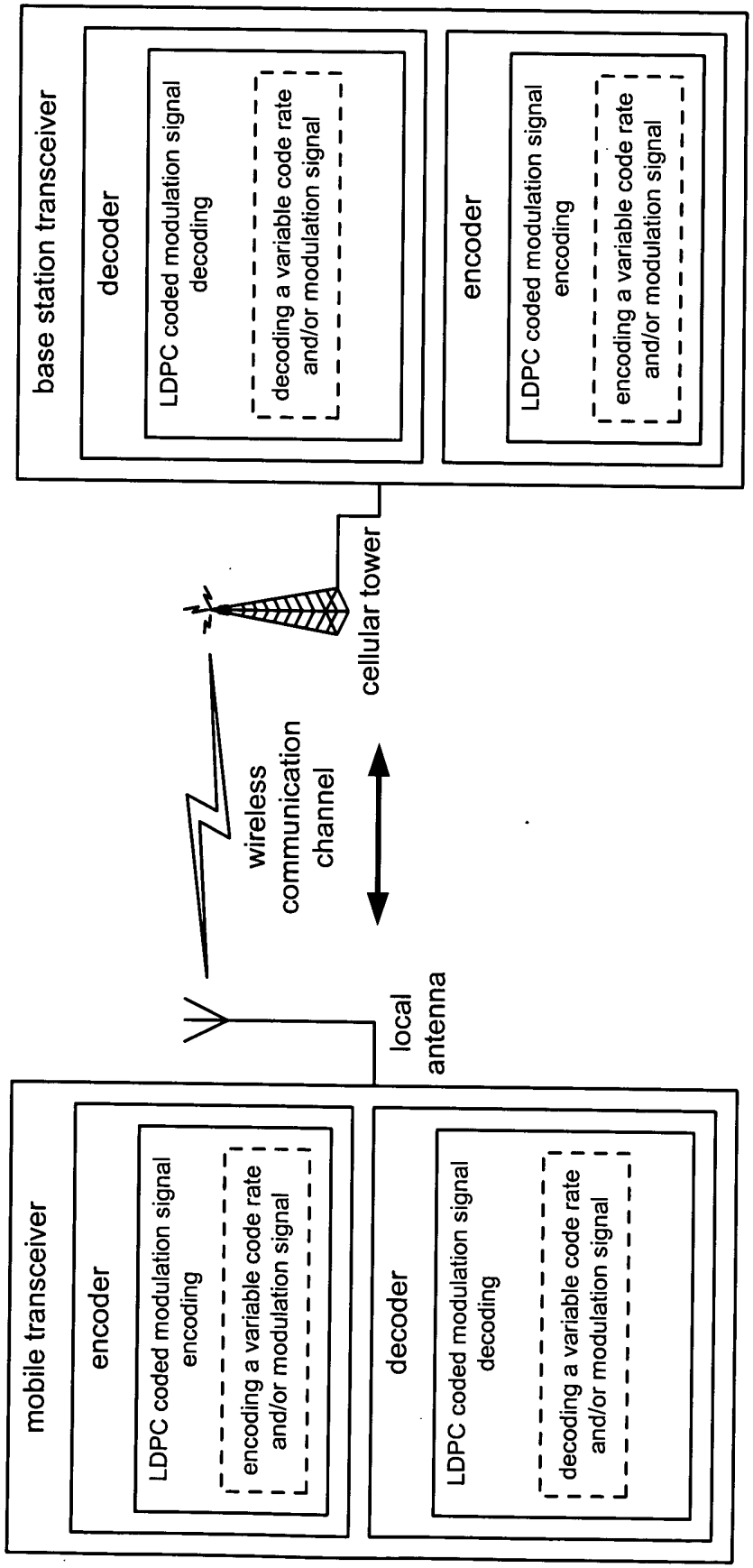
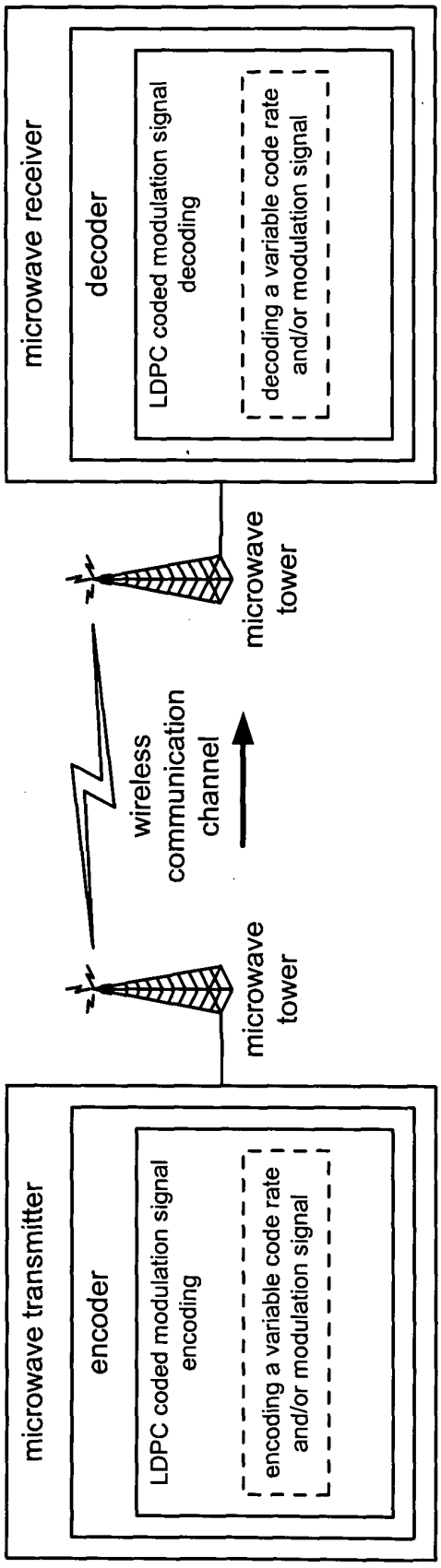

base station transmitter
encoder
LDPC coded modulation signal encoding
encoding a variable code rate and/or modulation signal
cellular tower
wireless communication channel
local antenna
mobile receiver
decoder
LDPC coded modulation signal decoding
decoding a variable code rate and/or modulation signal
uni-directional cellular communication system

Fig. 3B



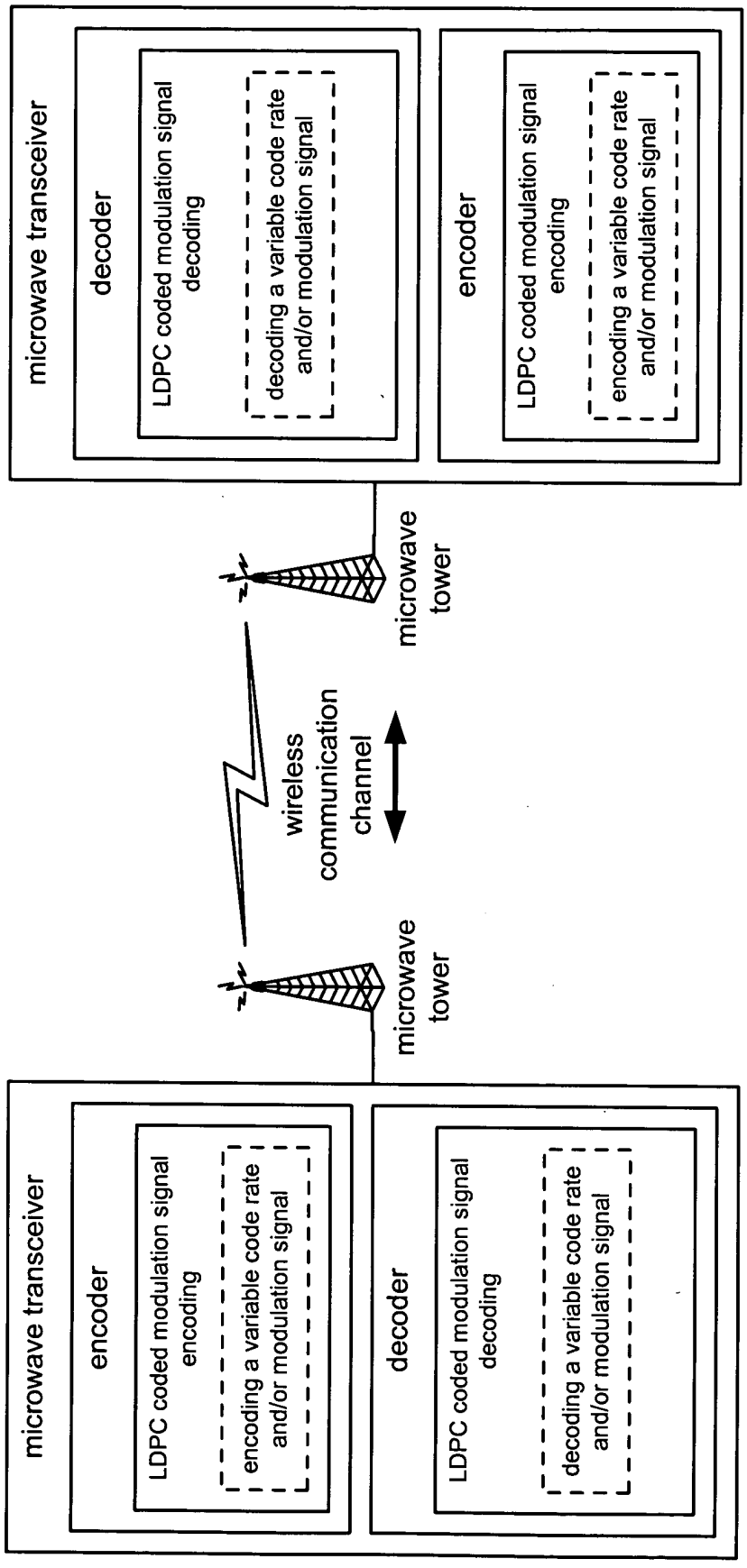
bi-directional cellular communication system

Fig. 4



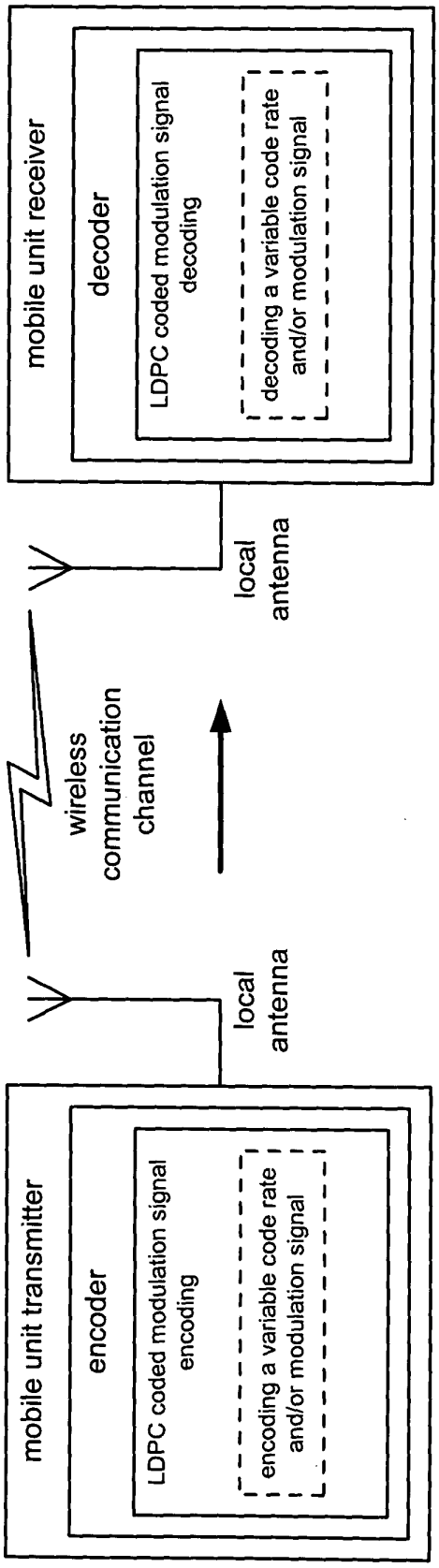
uni-directional microwave communication system

Fig. 5



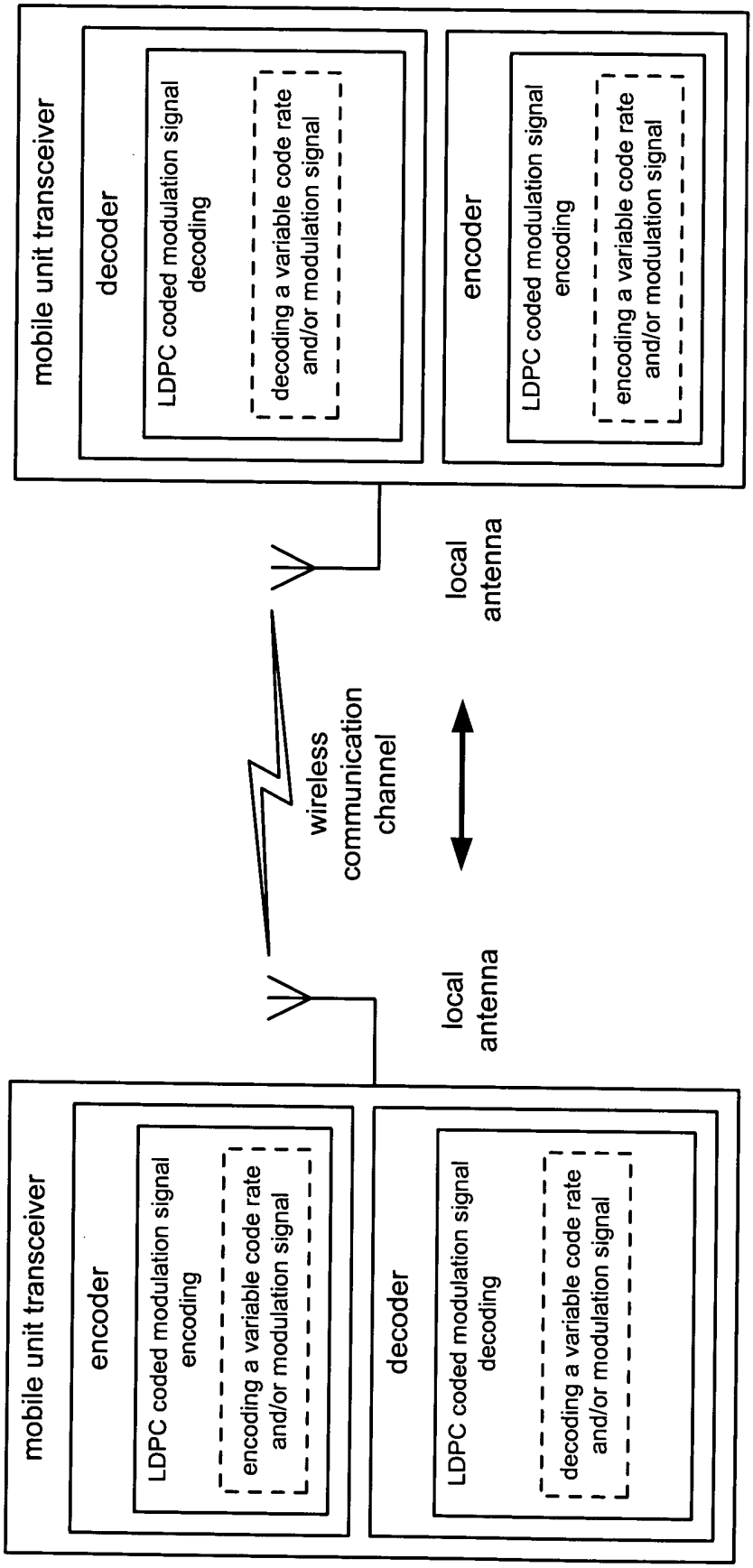
bi-directional microwave communication system

Fig. 6



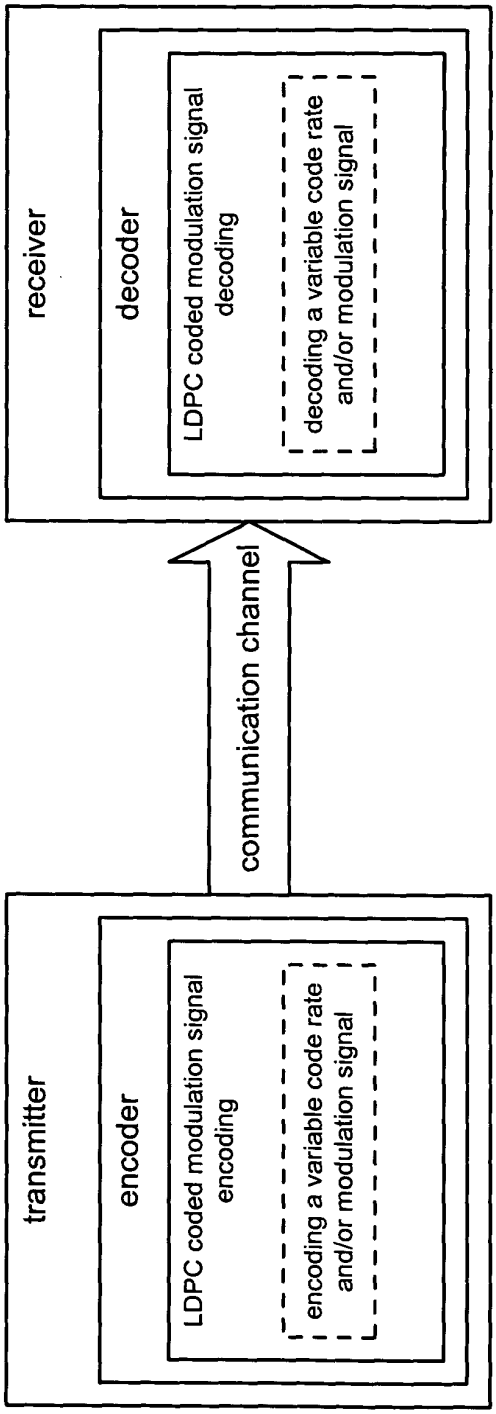
uni-directional point-to-point radio communication system

Fig. 7



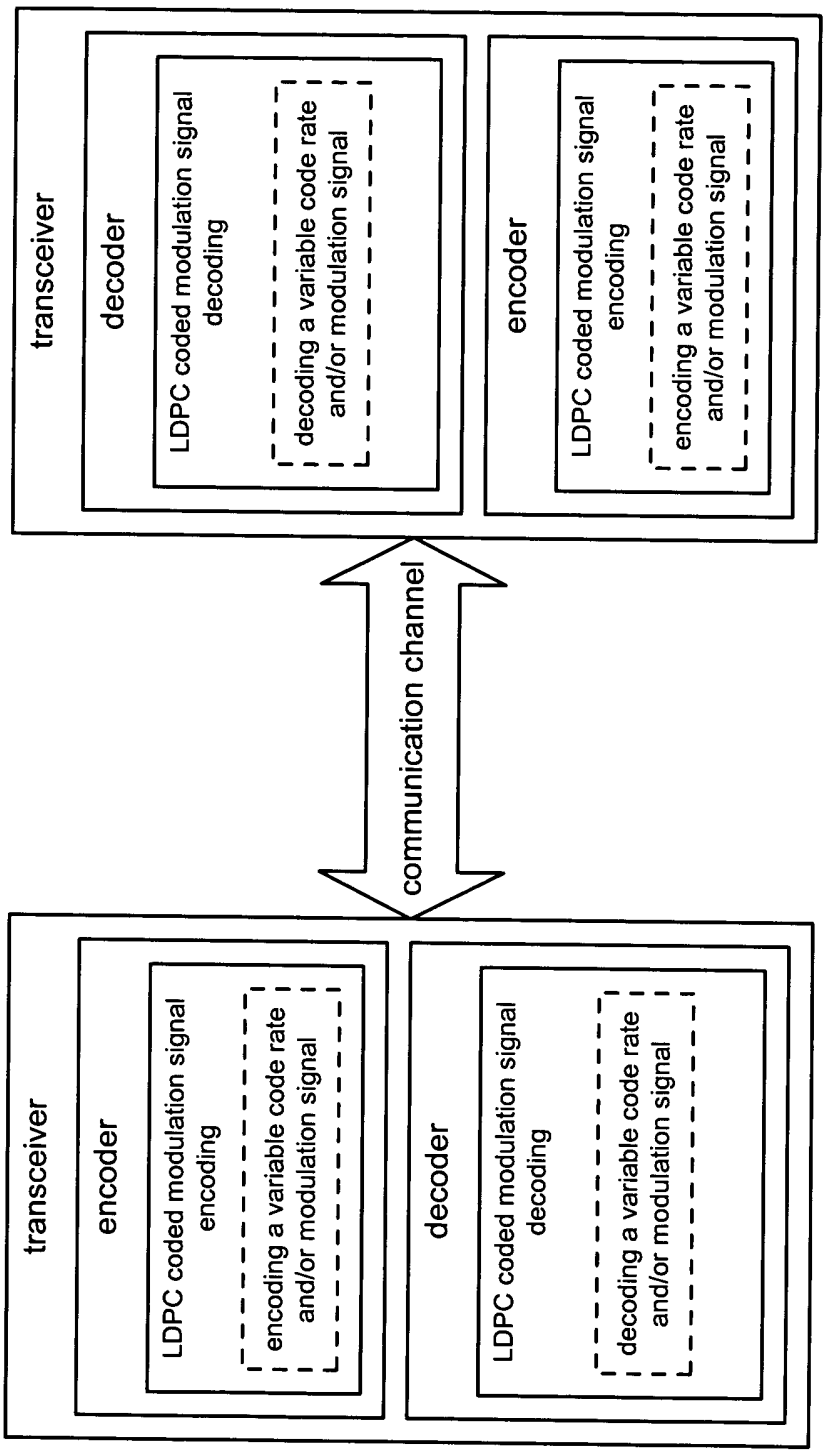
bi-directional point-to-point radio communication system

Fig. 8



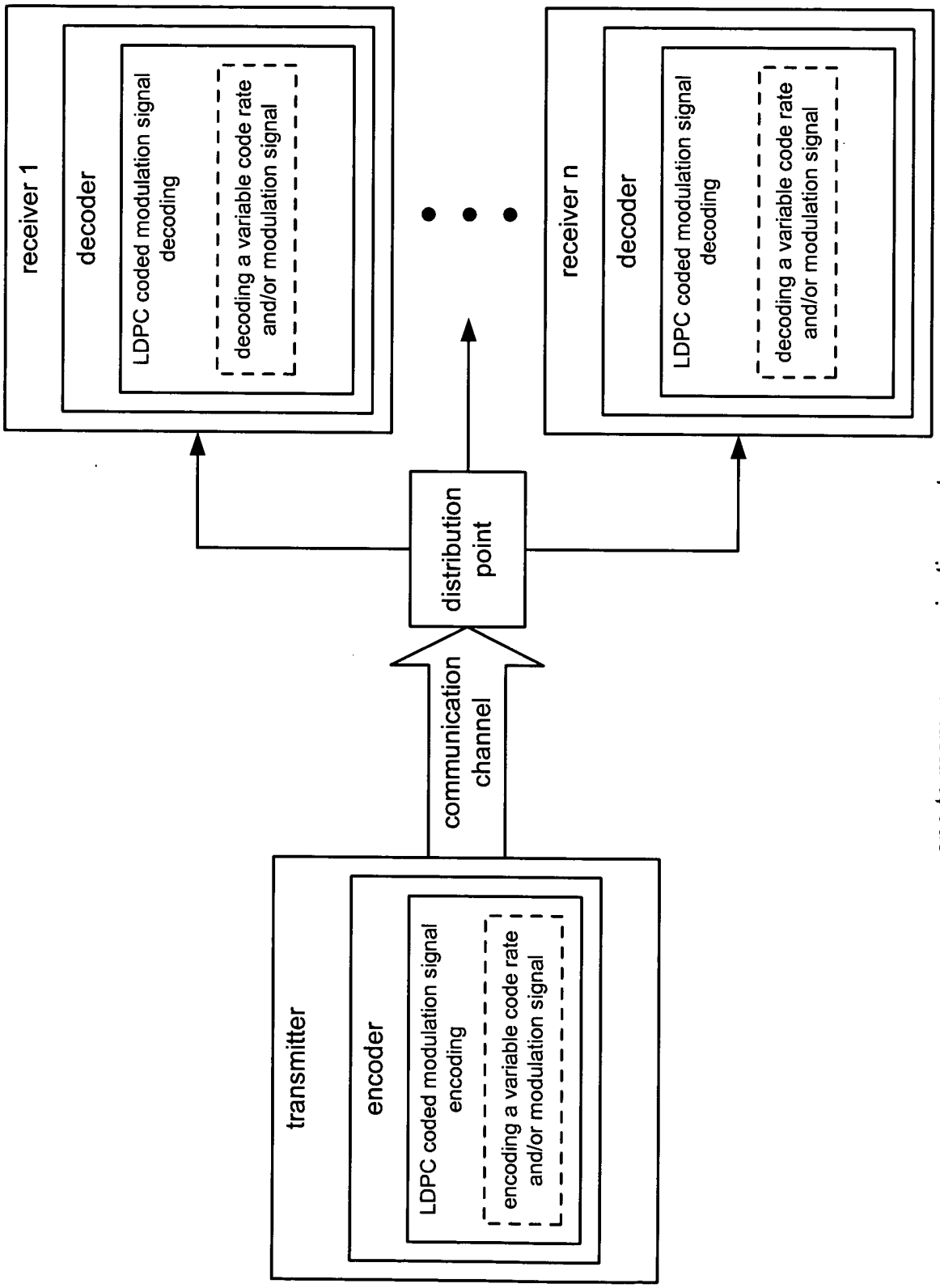
uni-directional communication system

Fig. 9



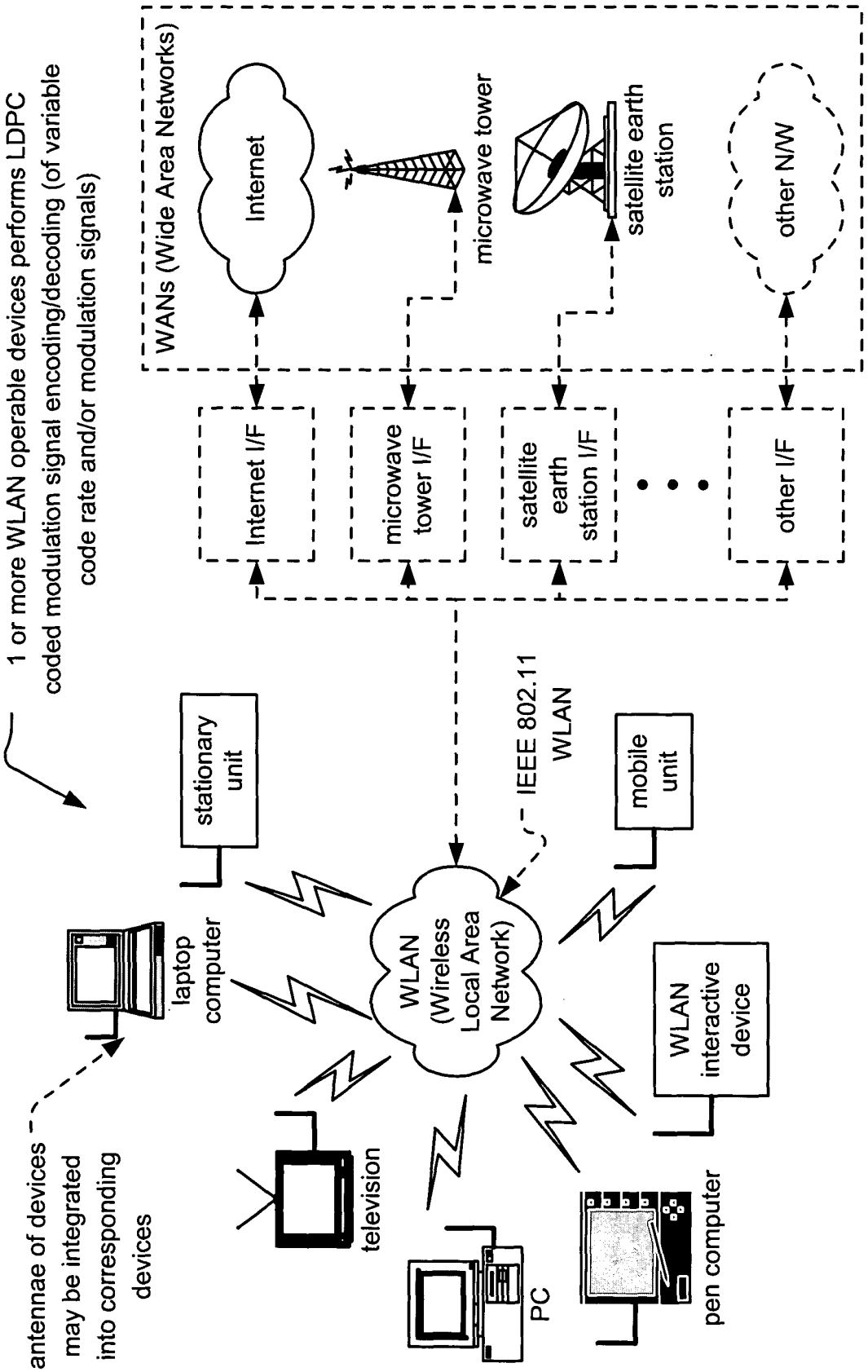
bi-directional communication system

Fig. 10



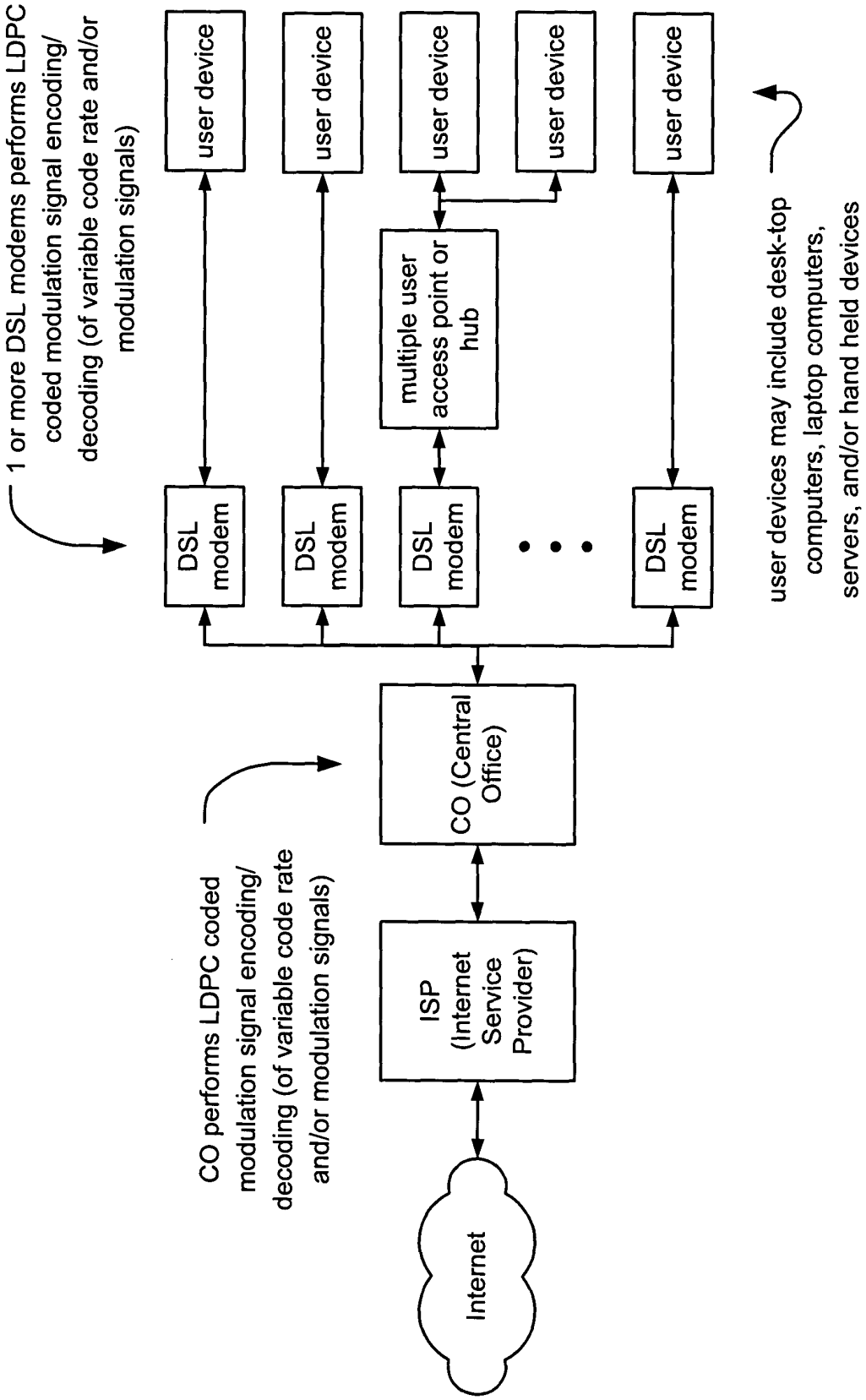
one to many communication system

Fig. 11



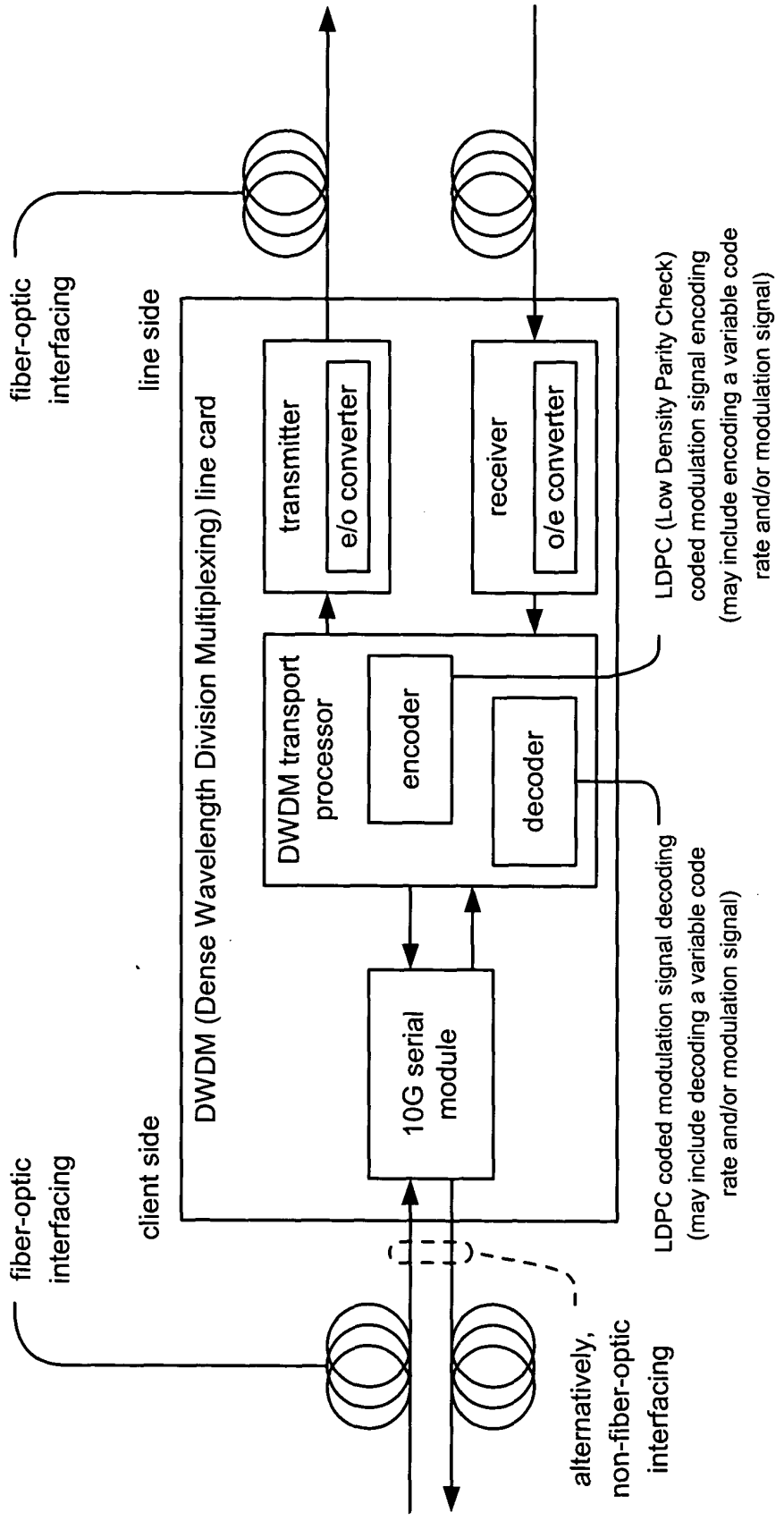
WLAN (Wireless Local Area Network) communication system

Fig. 12



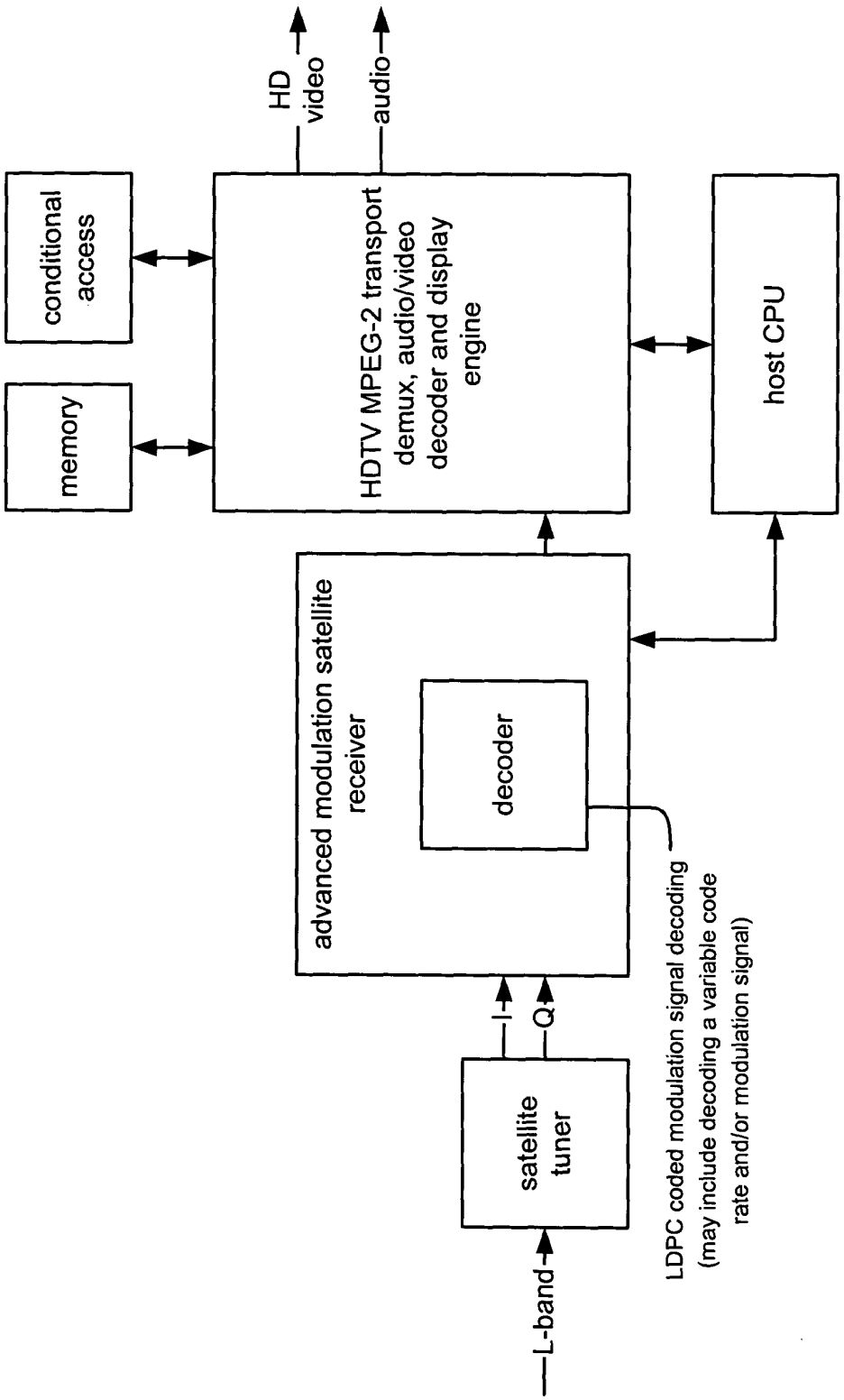
DSL (Digital Subscriber Line) communication system

Fig. 13



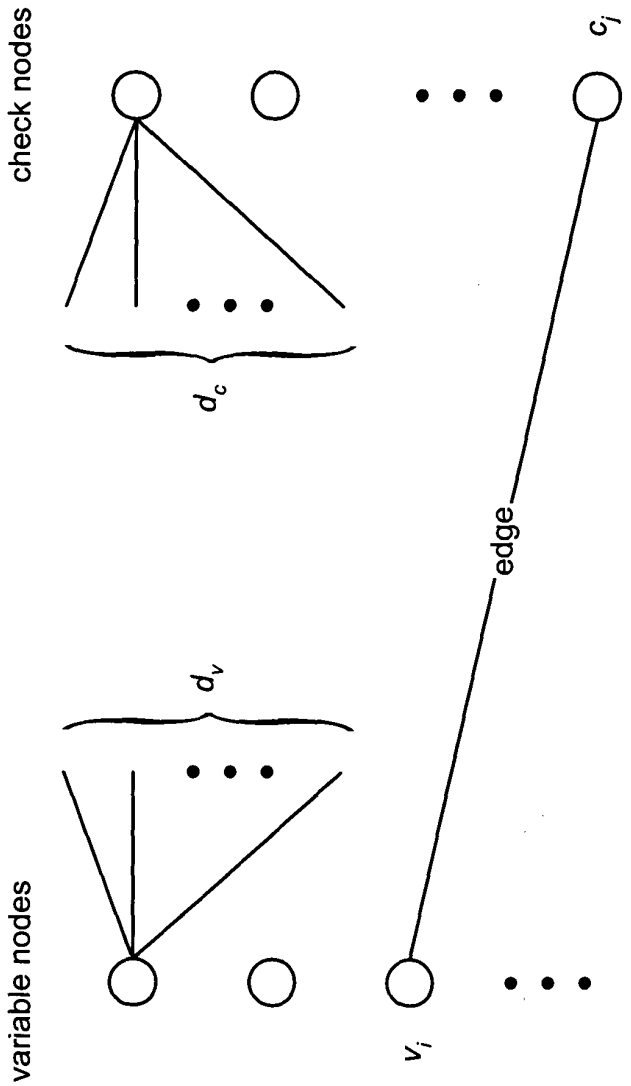
fiber-optic communication system

Fig. 14



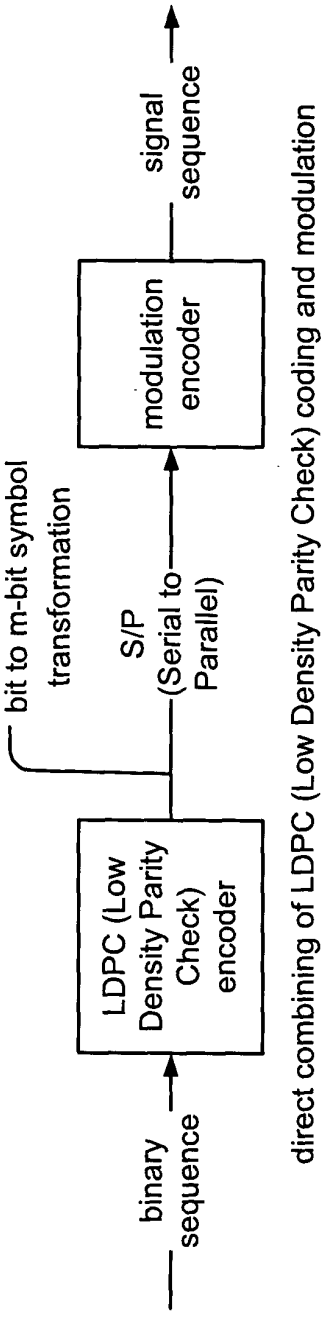
satellite receiver STB (Set Top Box) system

Fig. 15



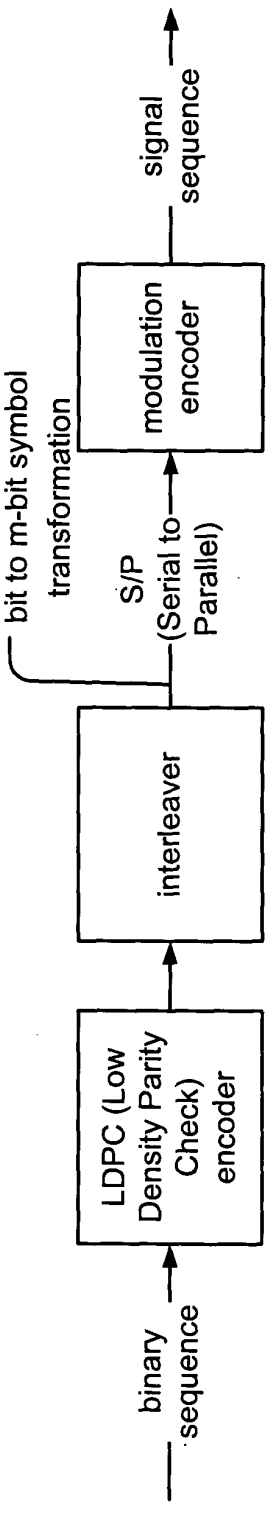
LDPC (Low Density Parity Check) code bipartite graph

Fig. 16



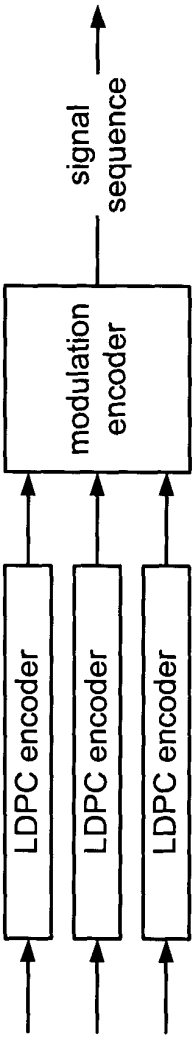
direct combining of LDPC (Low Density Parity Check) coding and modulation

Fig. 17A



BICM (Bit Interleaved Coded Modulation)

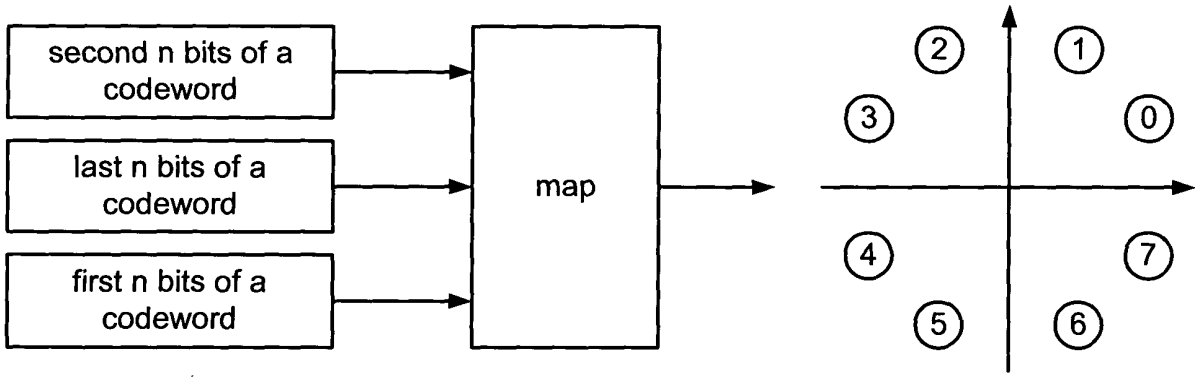
Fig. 17B



multilevel coded modulation

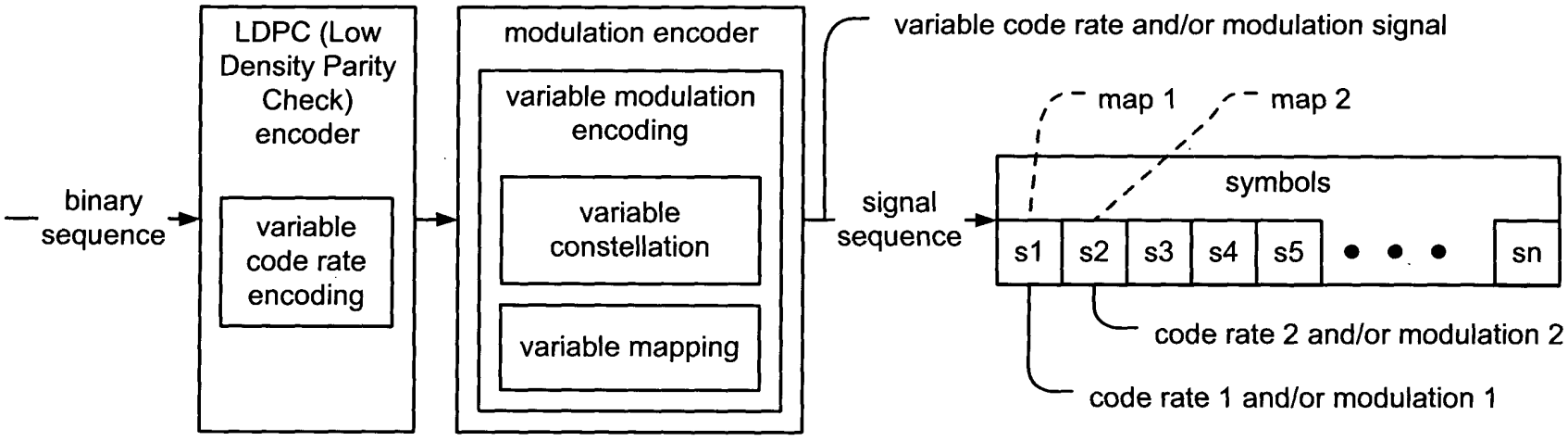
Fig. 17C

Map(000)=0; Map(001)=1; Map(101)=2; Map(100)=3;
Map(110)=4; Map(111)=5; Map(011)=6; Map(010)=7 (EQ 1)



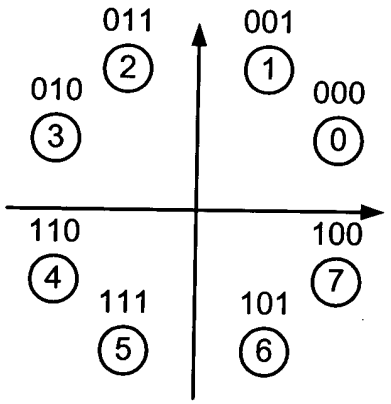
HNS (Hughes Network System) proposal to DVB (Digital Video Broadcasting Project) standard

Fig. 18A

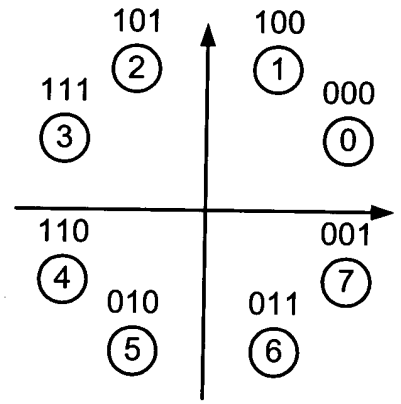


LDPC (Low Density Parity Check) coded modulation signal encoding

Fig. 18B



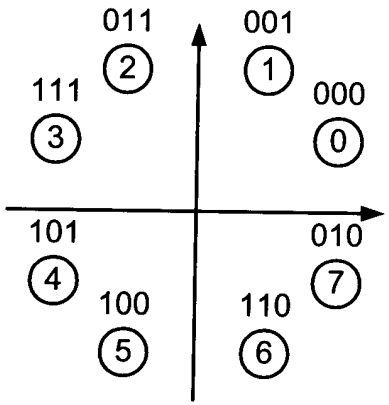
(0)



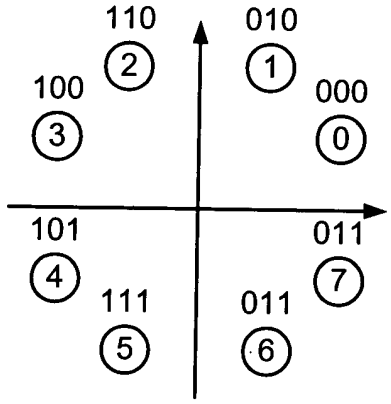
(1)

map 0 and map 1

Fig. 19A



(2)

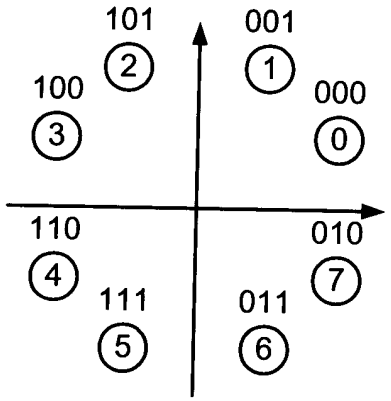


(3)

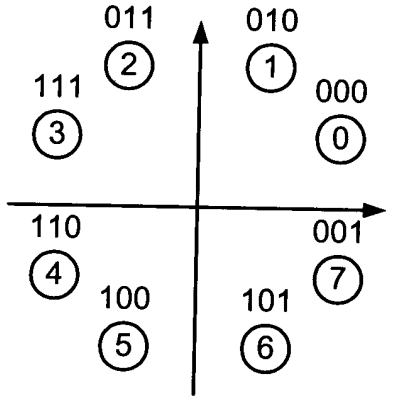
map 2 and map 3

Fig. 19B

Docket No. BP3036



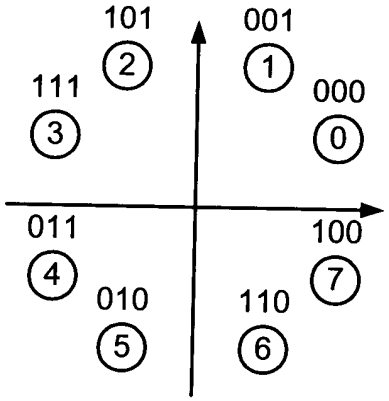
(4)



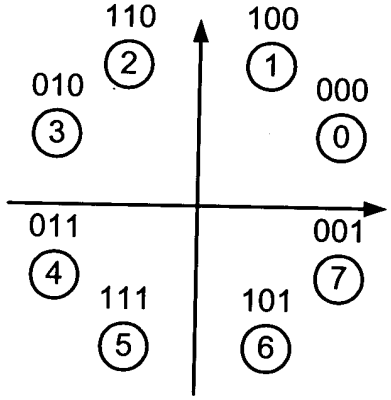
(5)

map 4 and map 5

Fig. 20A



(6)

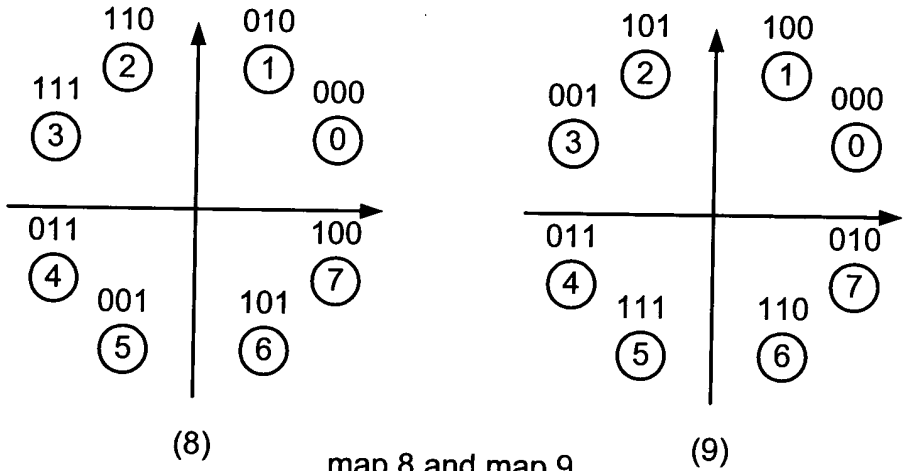


(7)

map 6 and map 7

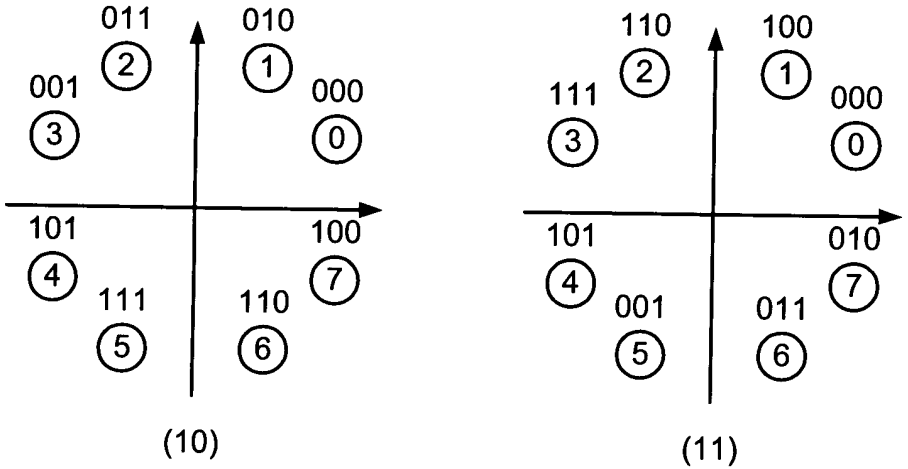
Fig. 20B

Docket No. BP3036



map 8 and map 9

Fig. 21A



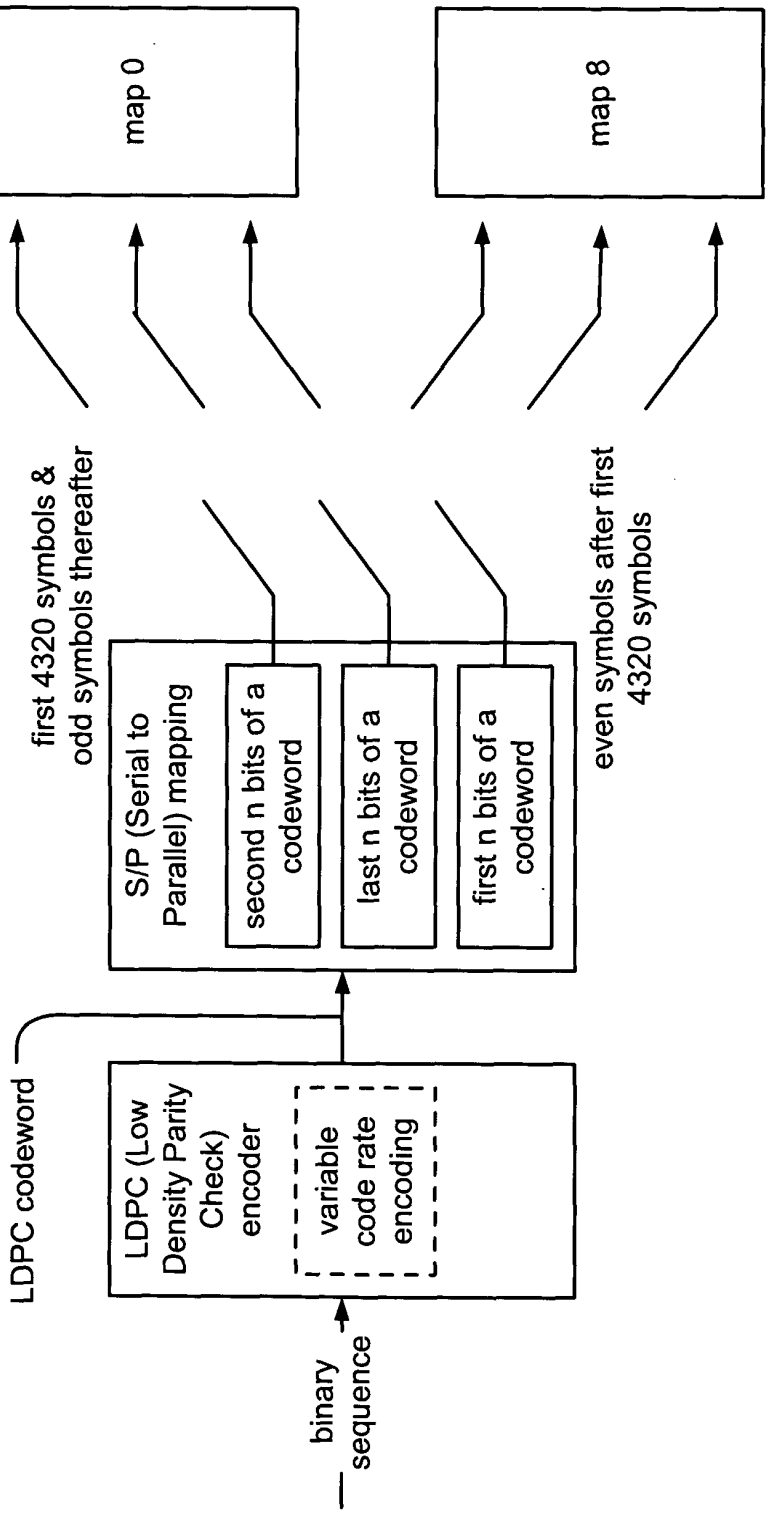
map 10 and map 11

Fig. 21B

map number	# weak points at MSB	# weak points at ISB	# weak points at LSB
0	2	2	4
1	2	2	4
2	2	4	2
3	2	4	2
4	2	2	4
5	2	2	4
6	4	2	2
7	4	2	2
8	4	2	2
9	4	2	2
10	2	4	2
11	2	4	2

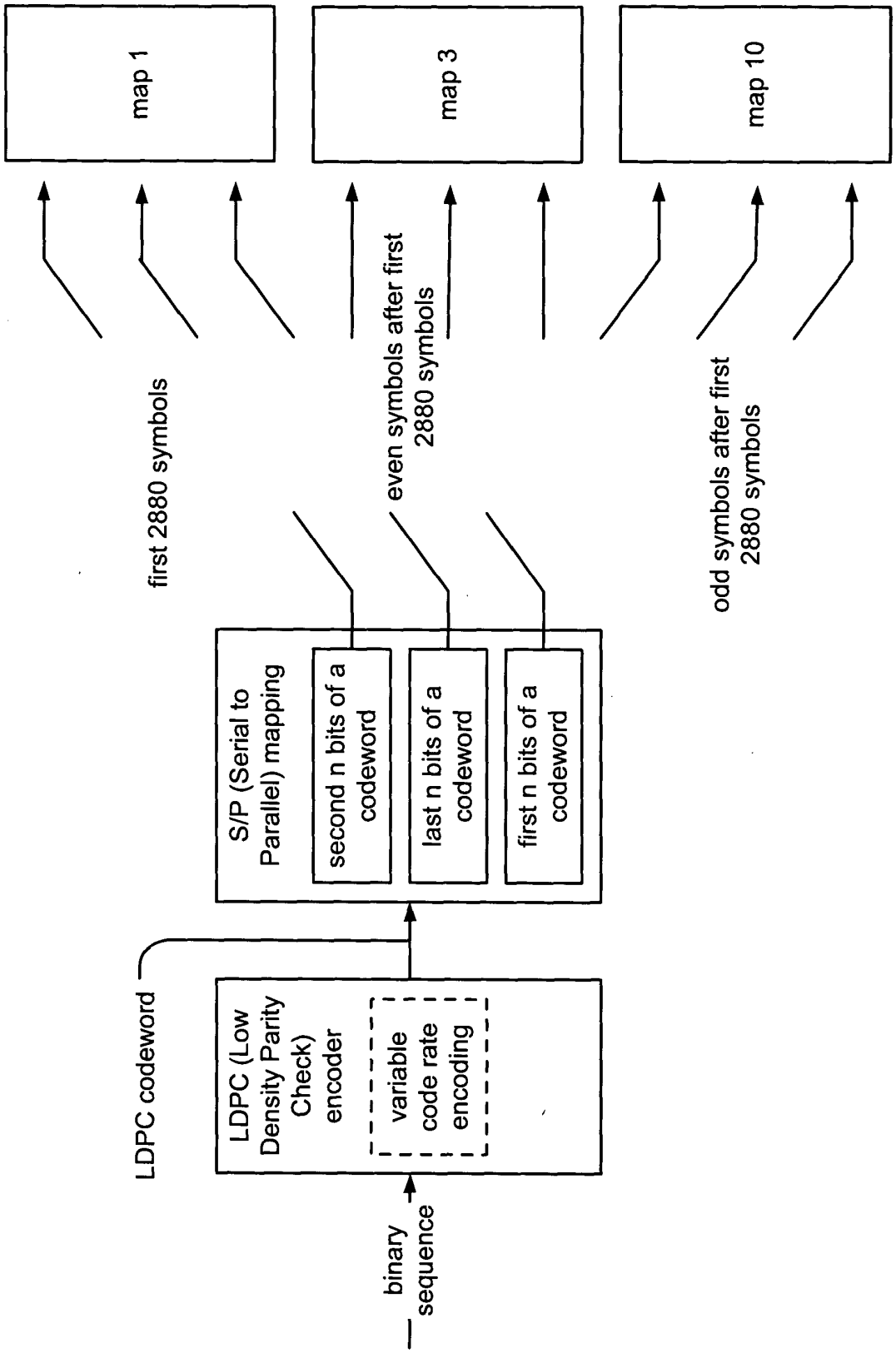
Table I

Fig. 21C



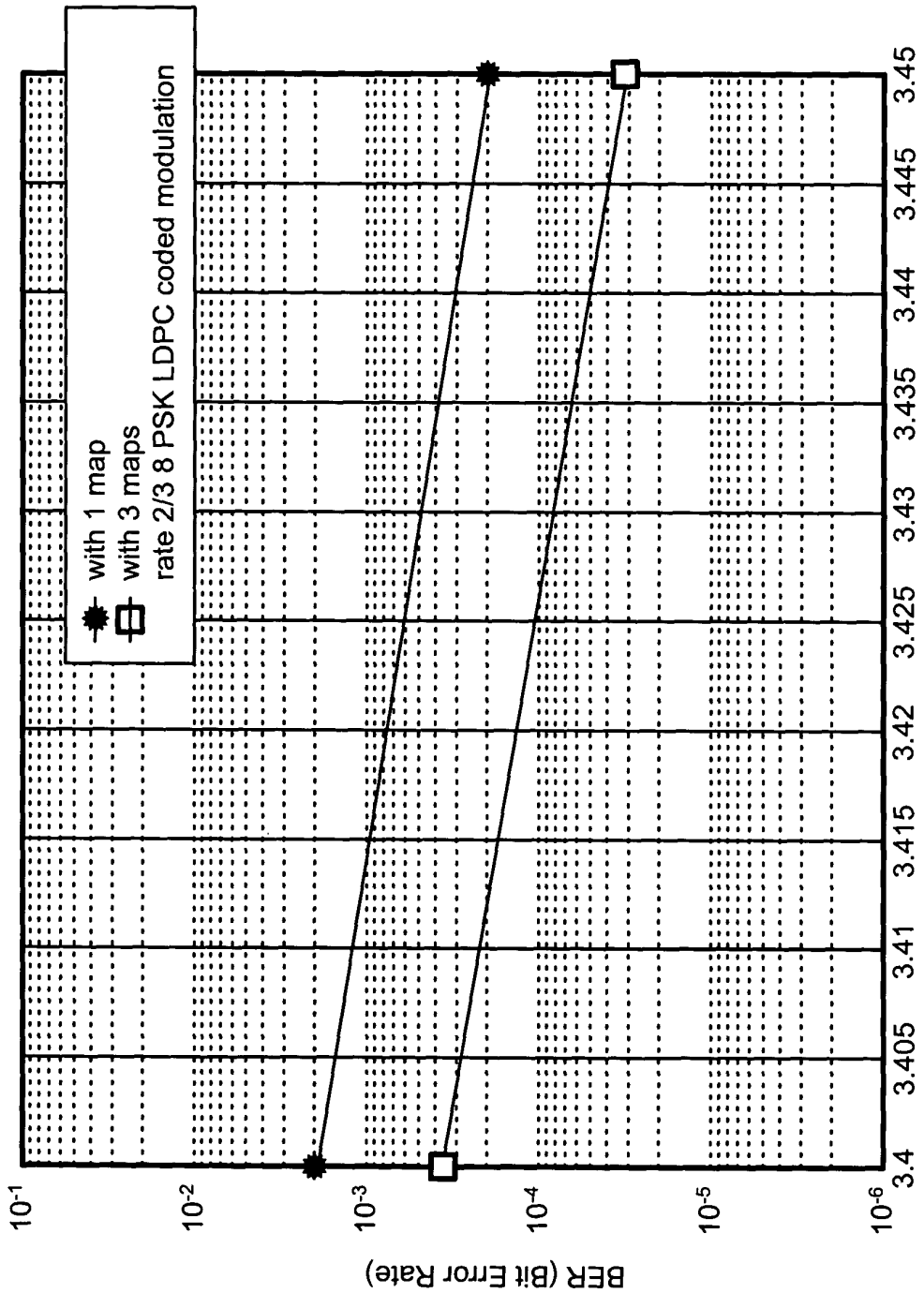
variable signal mapping LDPC (Low Density Parity Check) coded modulation system

Fig. 22



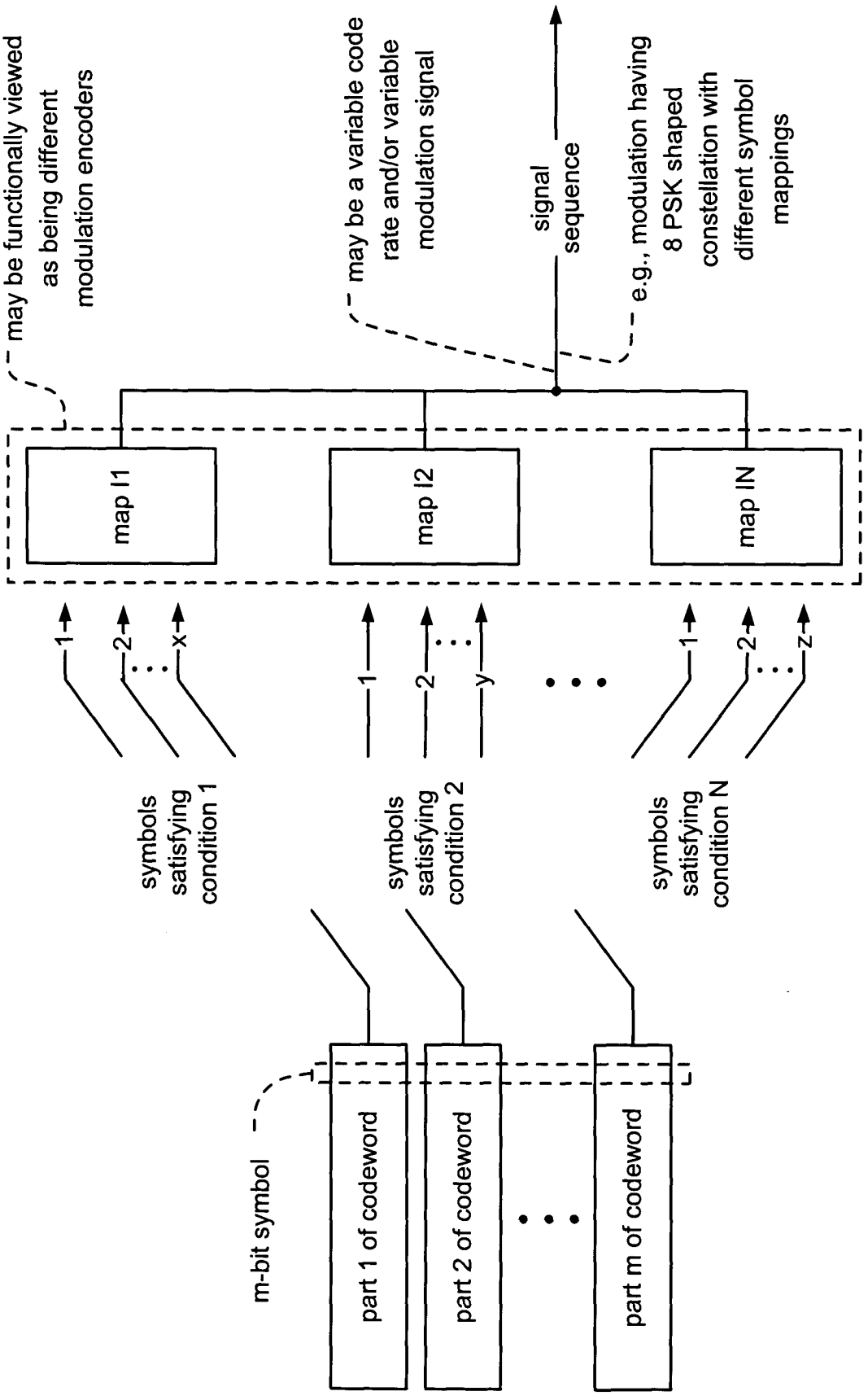
variable signal mapping LDPC (Low Density Parity Check) coded modulation system with code C_2

Fig. 23



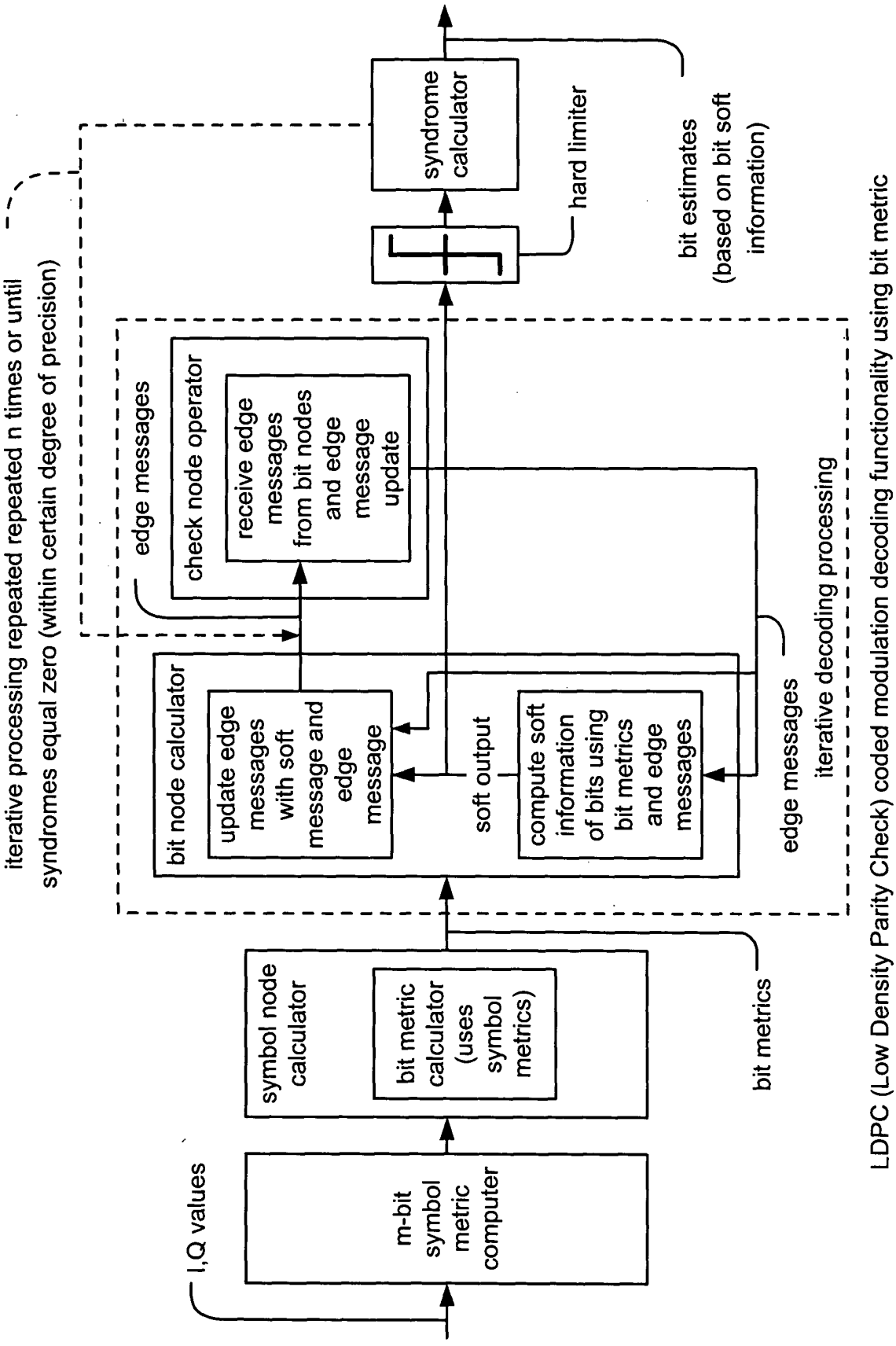
performance comparison of single map vs. multiple maps (1 map vs. 3 maps)

Fig. 24



variable signal mapping LDPC (Low Density Parity Check) coded modulation system

Fig. 25



LDPC (Low Density Parity Check) coded modulation decoding functionality using bit metric

Fig. 26

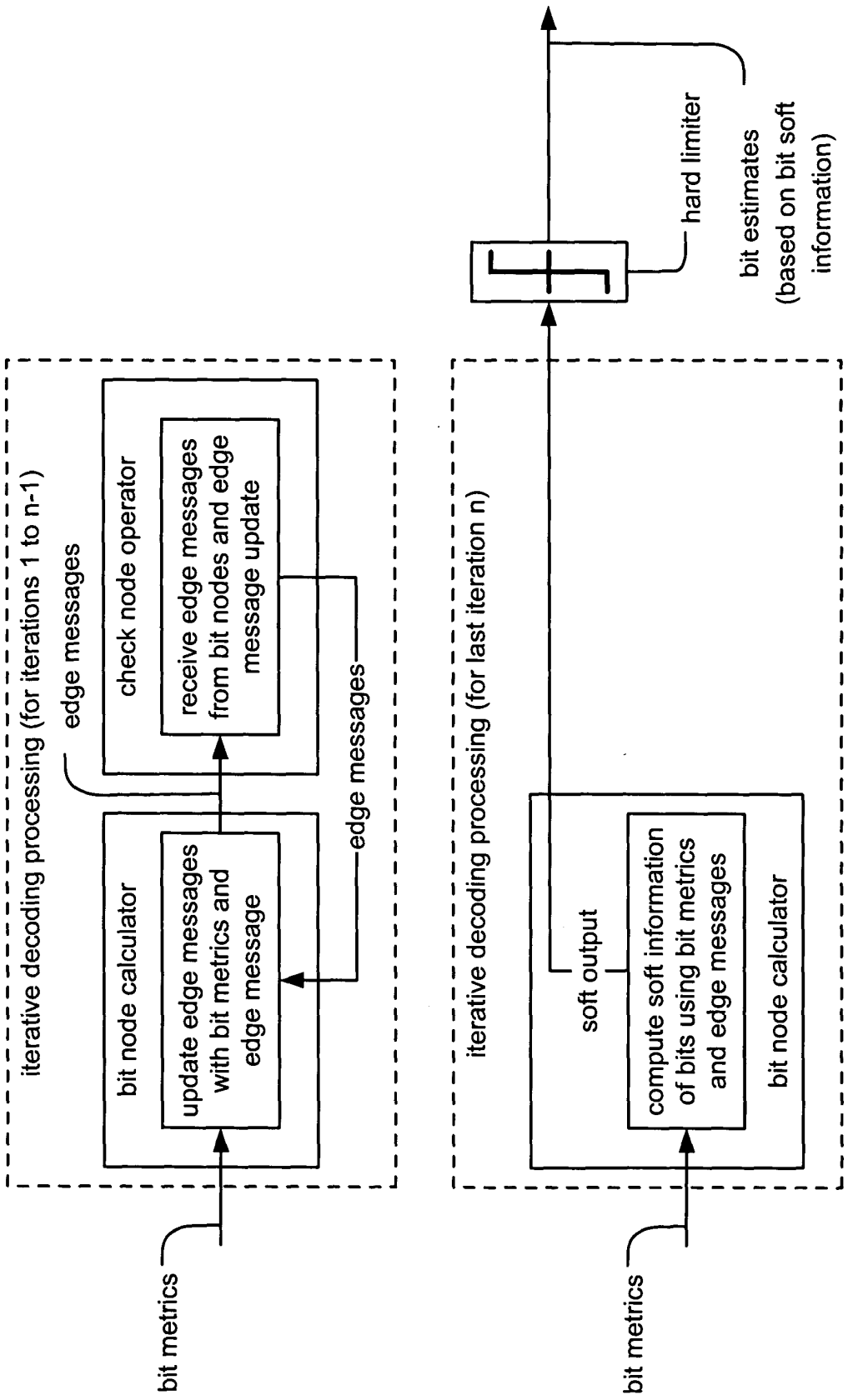
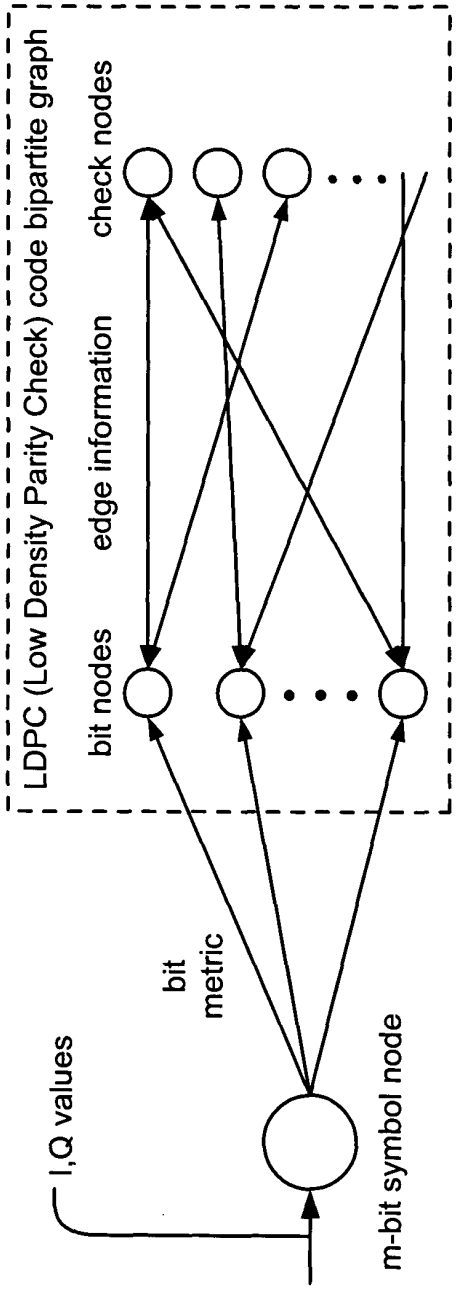


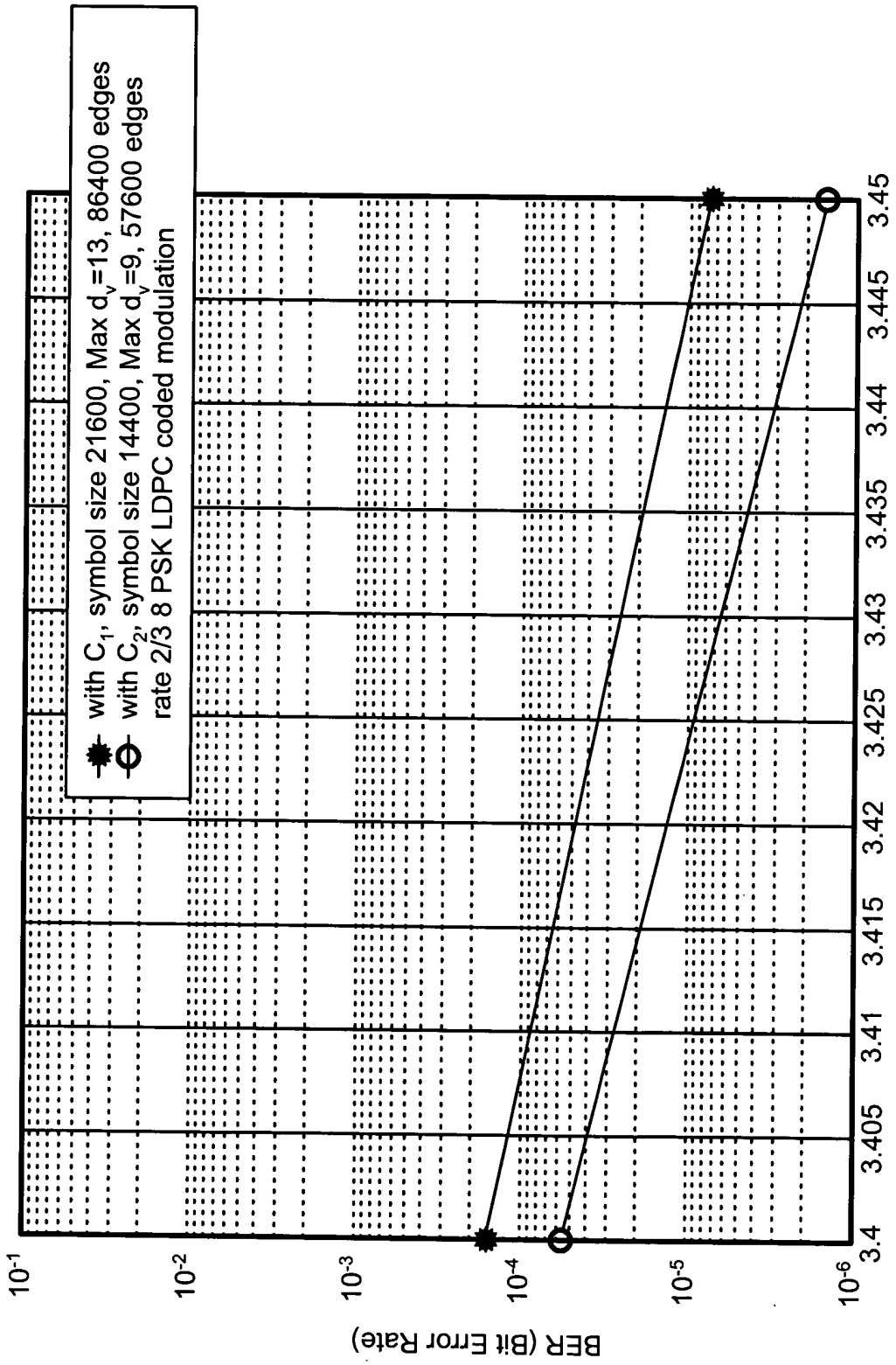
Fig. 27

alternative LDPC coded modulation decoding functionality using bit metric (when performing n number of iterations)



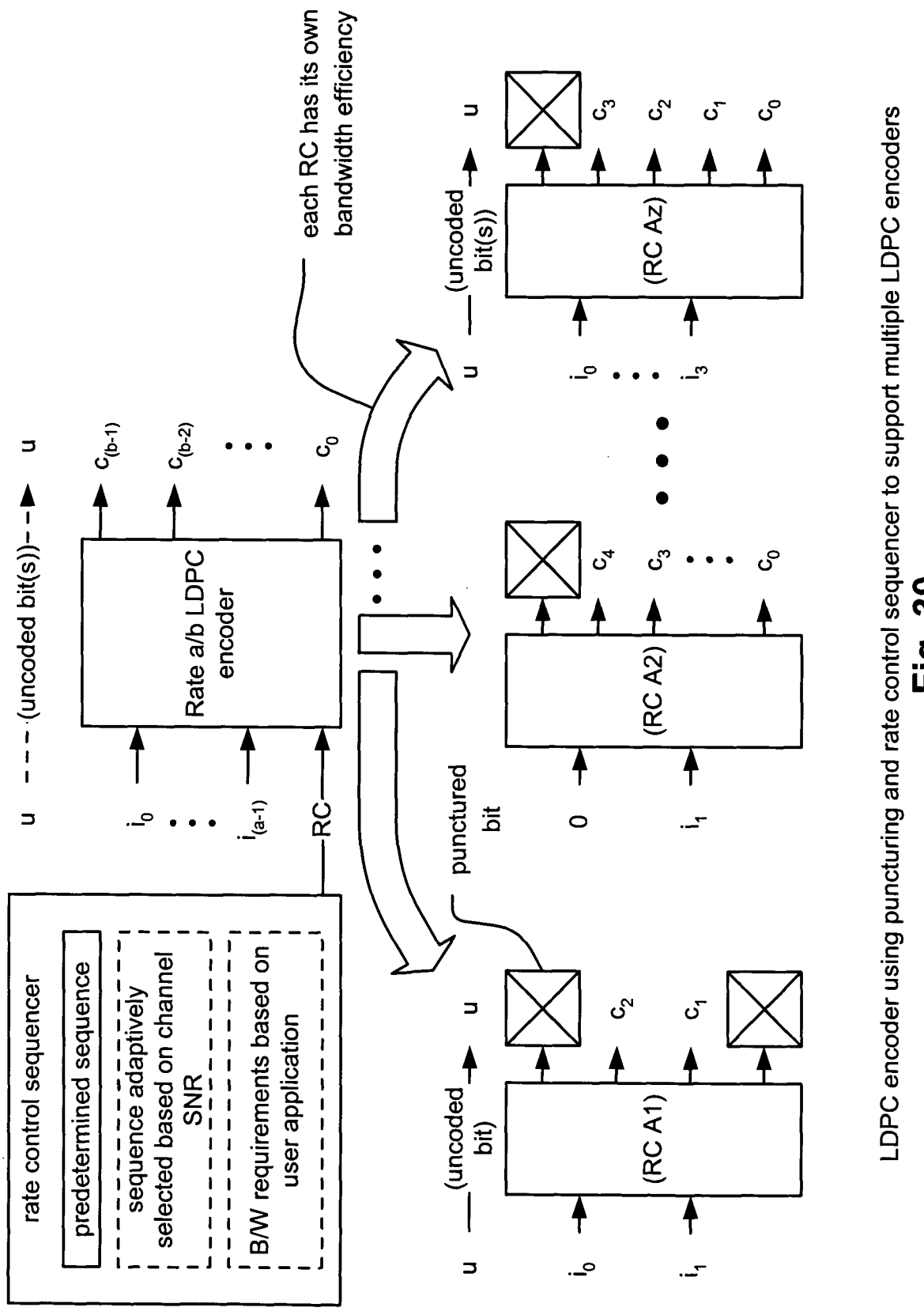
bit decoding using bit metric (shown with respect to LDPC (Low Density Parity Check) code bipartite graph)

Fig. 28



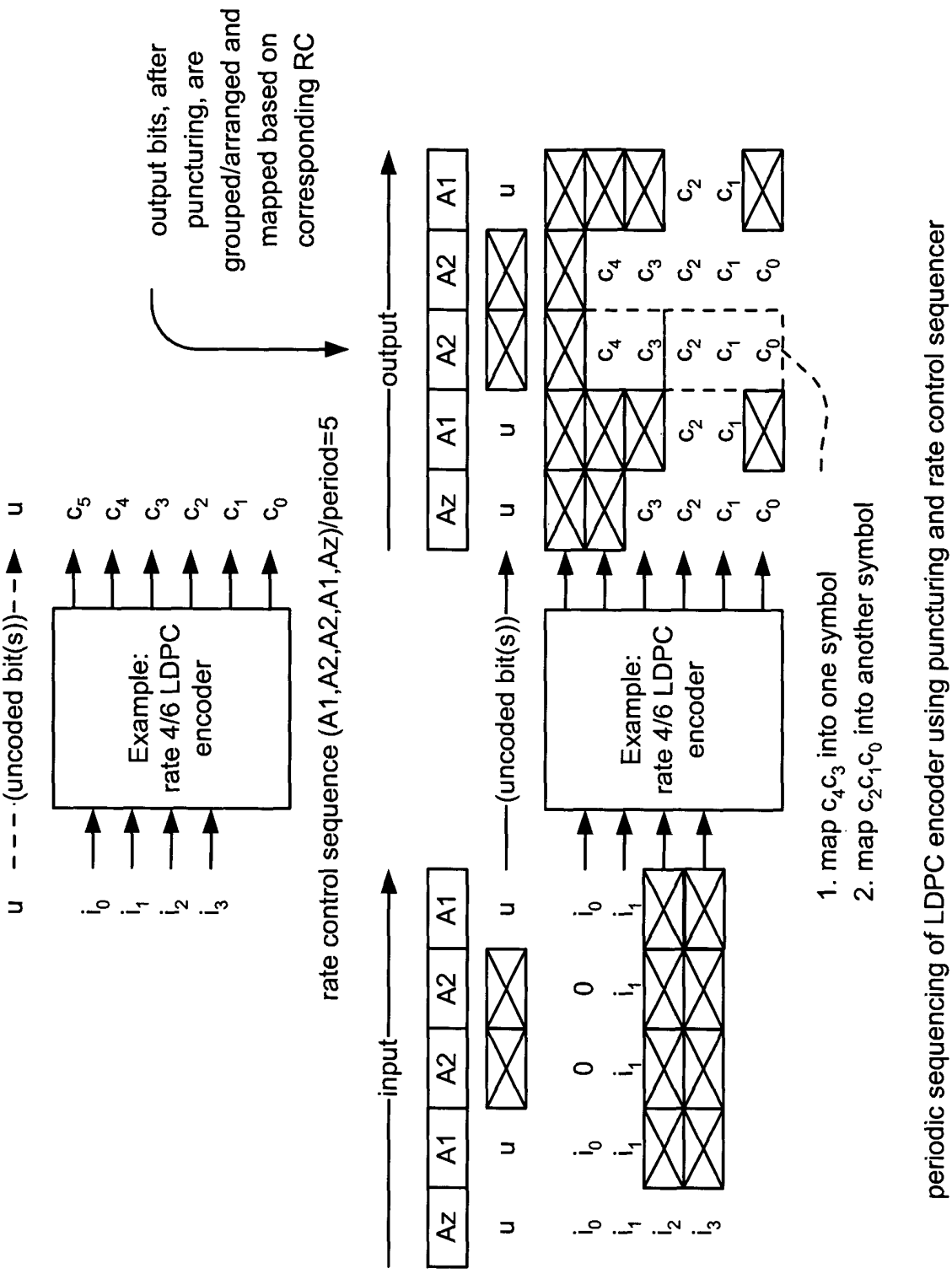
performance of LDPC coded modulation decoding of different symbol size
(1. block with 21600 symbols, 3 bits per symbol and 2. block with 14400 symbols, 3 bits per symbol)

Fig. 29



LDPC encoder using puncturing and rate control sequencer to support multiple LDPC encoders

Fig. 30



periodic sequencing of LDPC encoder using puncturing and rate control sequencer

Fig. 31

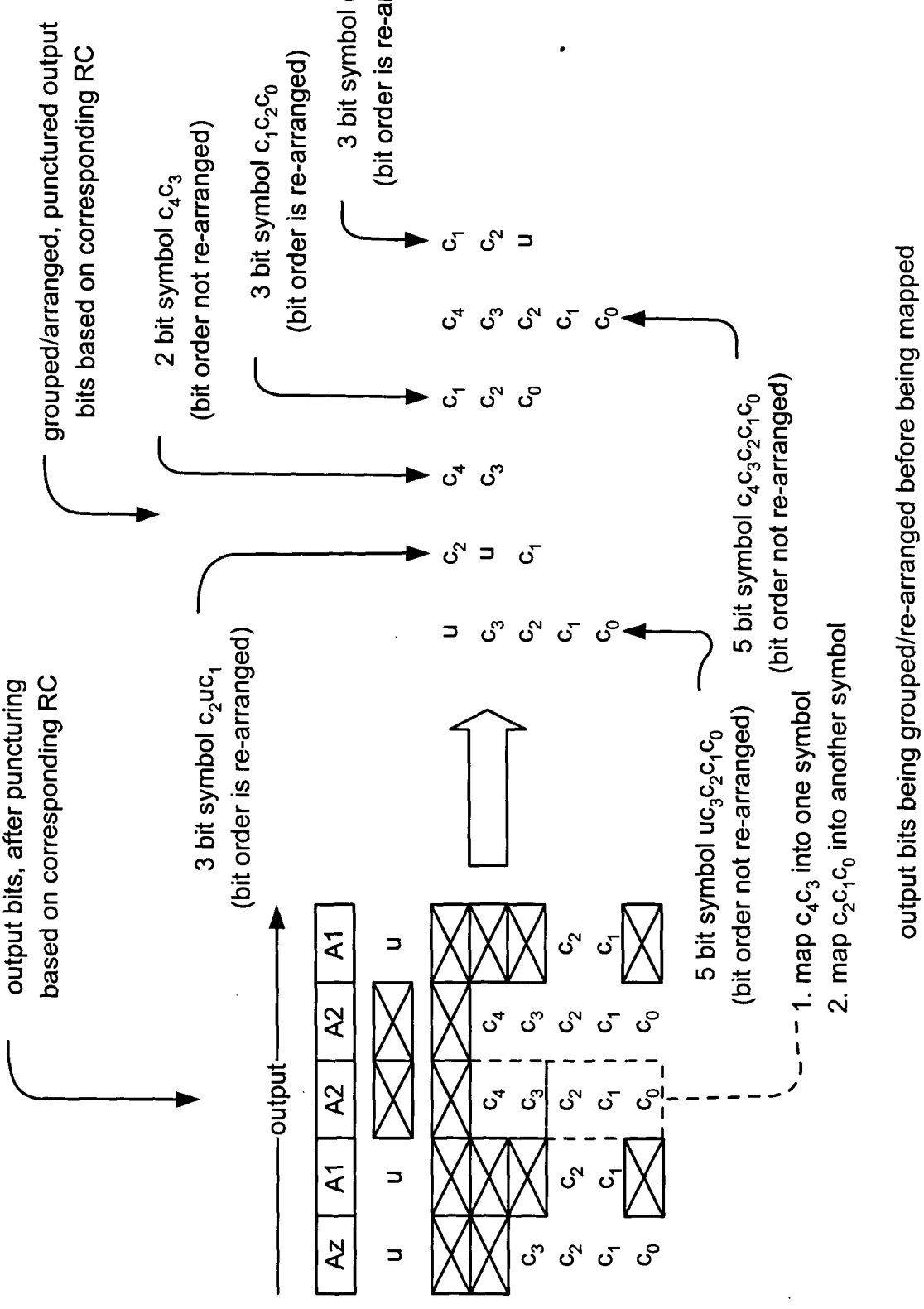
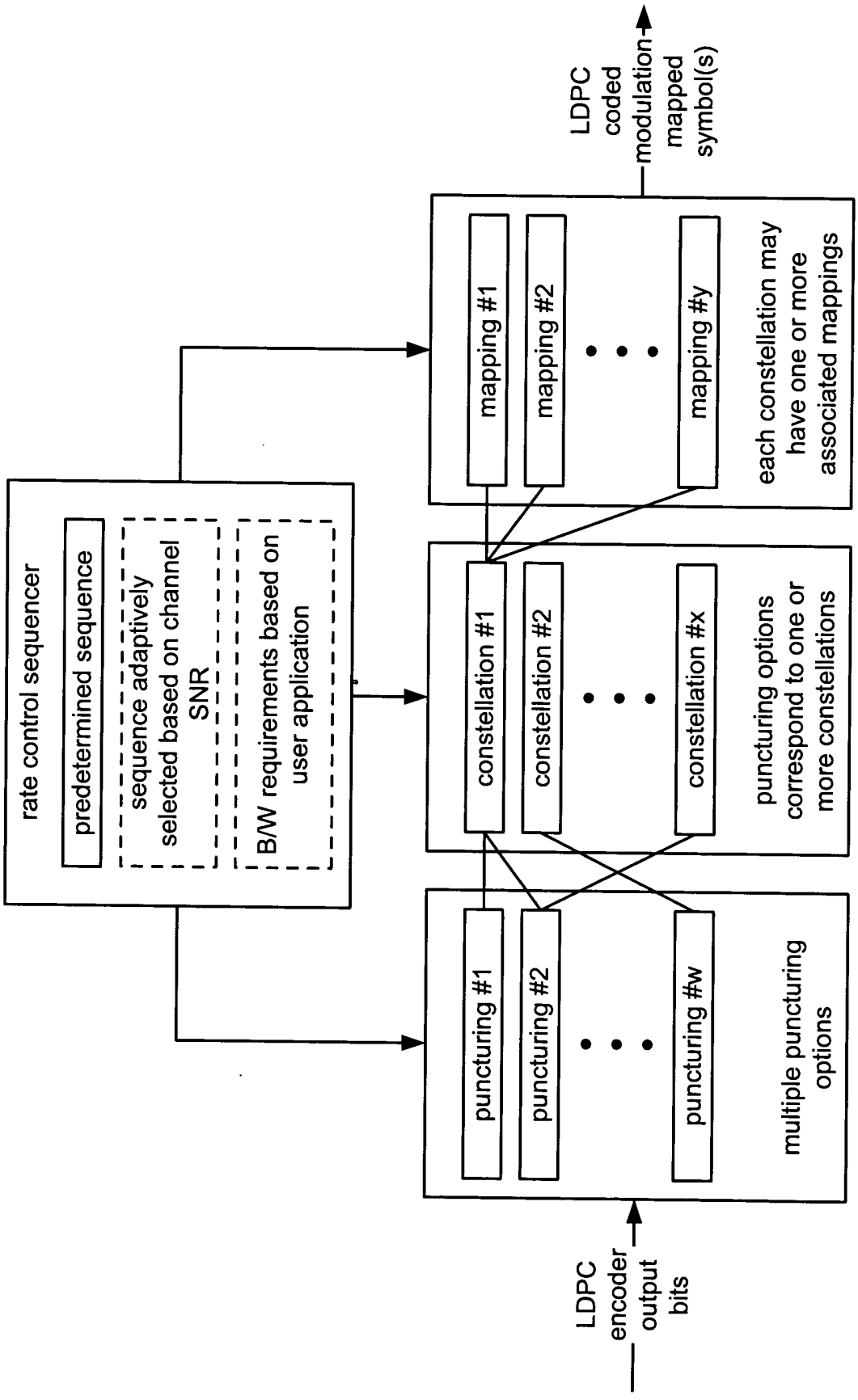

output bits, after puncturing
based on corresponding RC
grouped/arranged, punctured output
bits based on corresponding RC
2 bit symbol c_4c_3
(bit order not re-arranged)
3 bit symbol $c_1c_2c_0$
(bit order is re-arranged)
3 bit symbol c_1c_2u
(bit order is re-arranged)
3 bit symbol c_2uc_1
(bit order is re-arranged)
output
Az
A1
A2
A2
A1
5 bit symbol $uc_3c_2c_1c_0$
(bit order not re-arranged)
5 bit symbol $c_4c_3c_2c_1c_0$
(bit order not re-arranged)
1. map c_4c_3 into one symbol
2. map $c_2c_1c_0$ into another symbol
output bits being grouped/re-arranged before being mapped

Fig. 32



generic embodiment of variable puncturing, constellations, and mappings using single LDPC encoder

Fig. 33